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The N. E. L. A. 1918 War Convention

IN DECIDING to hold a war convention on June 13 and 14 the National Electric Light Association officials meet a real need for conference on the urgent problems of the times. The problems of normal years fall into the background, and the trials that now loom large call for the exercise of much patience, foresight, courage and ability. Central stations are not meeting merely to parade troubles. They are working constructively to overcome difficulties, but they ask co-operation and sympathy while they are doing it. An exchange of experiences will help the companies of enormous generating capacity, and it will be of still more value to the properties of medium and small size. Small properties feel most keenly the burden of present conditions, because in many cases they lack a margin of financial resource to withstand serious curtailment in net revenue due to abnormal swelling of operating expense. Therefore the lesson of the forthcoming Atlantic City convention may very wisely be directed to carry comfort to the operator of the property of moderate business volume. The convention will be effective in the degree in which it answers the two paramount questions of the day affecting central stations of average standing: First, how they can best help to win the war; second, how they can at the same time meet the pressing needs created by unparalleled demands for power, scarcity and high cost of capital, materials and labor, and inadequate rates.

Business Men Have Their Inning

REALIZING that without their efforts and resources the war cannot be won, American business men have given the country one of the most striking examples of what can be done in arousing industry to patriotic service and achievement. So prompt and so generous has been the response of business in this national crisis that the whole country has awakened to a profound faith in the big soul of business and has caught something of its spirit and felt something of its inspiration and determination. This week some three thousand of the nation's busiest manufacturers and merchants met in Chicago to deliberate over a constructive program for the war and the industrial struggle that is to follow it. It was not the gathering of any one industry but a great gathering of all kinds of business. While labor and agriculture have been organized for a long time in this country, it has remained for business in recent years to organize a democratic form of expression. War-time organization of industry was the dominating subject, as well it might be, for has not the government within the past week showed its appreciation of some of the problems of business? The Webb-Pomerene bill, passed by Congress last week, assures the American business man a fighting chance in foreign markets, and the War Finance Corporation bill will provide him with funds to turn out the sinews of war for ourselves and our allies. Thus business men have a new hope for the future. With the government at their elbow to encourage and to help, and with the added incentive to greater accomplishment for the purpose of winning the war, nothing is impossible for business men. Moreover, the constant drive for greater and more efficient production will serve as an excellent training for world competition in foreign markets.

Economy in Power Plants

A VERY practical and effective paper on this subject was recently read by C. H. Parker of the Edison Electric Illuminating Company, Boston, and it is abstracted to the advantage of our readers in the current issue. It is probably altogether true that there are very few plants where no saving can be effected. Any carefully conducted boiler test can be assumed to yield better results than will be obtained in regular running, quite aside from all questions of steadiness of load. After all, economy in coal consumption comes back to care in stoking, whether in attention to the automatic machinery or in supervising the details of hand firing. Mr. Parker points out that it is a perfectly easy matter to cause a loss of 10 per cent in the heating value of the fuel by neglecting attention at this point, and he might have added that greater losses are too common.

In these days particularly, when unwonted grades of coal are being used, study of the details of combustion is all-important to economy. There are, too, minor losses, such as those due to water and excessive smoke. These are small on the whole, but the smoke matter is important on account of the indications it gives of improper firing, although a smokeless chimney does not necessarily mean an efficient furnace. Standby losses are in large measure dependent on the character of the load and the skill of the load dispatcher. Thorough watching of the performance of the boilers and furnaces gives the clew to moves for economy. In some plants overloading is a necessary evil, and here the judicious use of forced draft will often result in saving, especially through enabling the operator to work boiler and furnace at their most efficient output a larger proportion of the time.

Gas-Filled Lamps for the "Movies"

ONE of the very useful recent developments in incandescent lamps is the production of a special type for optical projection, especially in that wide field which is furnished by the "movies." Until within a very short time the arc lamp was the only reliance for projection on a practical scale. It combined two advantages of supreme importance for the purpose, great light-giving power and the extremely high intrinsic brilliancy which makes it possible to reduce the source of light to very small dimensions. The former quality is of great importance in projecting pictures at high magnification; the latter makes it relatively easy to get good definition with an optical system of moderate dimensions. The ordinary incandescent lamp was long ago developed into a projection lamp with a flat spiral filament which gave fair results on a small scale but was by no means good enough for motion-picture work. With the coming of the metallic-filament lamp still further improvements were made, but the low intrinsic brilliancy always stood in the way of successful competition with the arc. The gas-filled lamp has very materially changed the situation, so that now it is practicable to use it for regular projection work, gaining thereby the immeasurable boon of steadiness, a quality in which the arc is unhappily lacking.

The intrinsic brilliancy of even the gas-filled lamp is only about one-fourth that of a direct-current arc, so that particular pains have to be taken in the design of the projection apparatus to make up for this loss by higher efficiency of utilization. The brilliancy of the filament is limited by its possibilities of life, and it is also dependent on the actual diameter of the filament. The larger this diameter, the higher the brilliancy that can be secured without loss of effective life. In the most recent form of lamp for projection purposes, as is well shown in our paper by R. P. Burrows and J. T. Caldwell, an arrangement of filament is adopted which brings all the coils into very nearly the same plane compressed into as small an area as practicable. This arrangement gives a distribution of light strongly outward from the front and rear of the plane and consequently in the directions most useful for the projection. The filament must be placed in a bulb of relatively small diameter in order to afford available space for placing the projecting system, and hence the filament is actually mounted in a long cylindrical bulb to obtain this advantage with the requisite bulb space. The optical system itself which furnishes the working beam consists of a spherical mirror of rather short radius behind the filament and a Fresnel lens of short focus in front. The light which proceeds from the rear of the filament plane is reflected back upon it, and by careful focusing the system of images can be made to fall between the loops of the actual filament, so as to produce a virtually nearly uniform plane of light in the focus of the lens.

With this sort of source it is possible to use a projection lens of wider aperture than usual, since there is no longer danger of magnifying the flicker of the arc lamp. With an equipment of this kind it is easy to throw a picture 12 ft. by 14 ft. (3.7 m. by 4.3 m.) in dimensions on a first-class screen up to at least 90 ft. (27.4 m.) distance. In other words, one can do the regular standard work of the motion-picture theater with highly satisfactory results and with a minimum of care and trouble. The standard type of lamp used is for 20 amp. and about 30 volts. It is superlatively easy to work this off an alternating-current circuit, and a special transformer has been developed for this purpose with provision for taking care of the variations in line voltage and for cutting out the rush of current into the cold lamp at the starting. On direct current a motor-generator or its equivalent has to be used unless one cares to waste an inordinate amount of energy in a rheostat. Oddly enough, this just reverses arc-lamp practice, where direct current is relatively easy to use and alternating current involves some trouble. The advantage of the incandescent lamp for projection lies in the fact that when once adjusted it stays on the job without further trouble, eliminating flicker, always staying in focus and saving energy. The problem of beating the arc at its own game has been no easy one, but it seems to have been finally solved in a very successful and practical manner.

Preparing for Industrial Load

IN THESE days of daylight saving the uninformed public imagines that central stations are likely to lose most of their revenue and save most of their coal. The said uninformed public may, however, acquire a new idea or two by noting our article in the current issue on what is being done in one New England city in the way of preparing for industrial load of rapidly growing dimensions. The scene of operations is New Bedford, where textile work is on the jump, and the present article supplements that in our Feb. 23 issue by giving additional details of the big station in that city. It gives some adequate impressions of the requirements of the present situation in dealing with increasing service. The piping arrangements of the new plant in particular are deserving of comment. The water supply has been the subject of particular study. The feed-water system is installed in duplicate, with duplicate connections for supplying the make-up water from the city mains, the general supply, of course, being taken from the condensate well. To save using city water a portion of the condensate is utilized for circulation around the bearings of the turbo-generators and then fed back again to the well. The supply to the boilers is measured by flow recorders, one for each of the 5000-hp. feed-water heaters, with an auxiliary meter to check their performance.

The steam piping has been similarly devised for flexibility of connections and short runs to the generators. The boilers deliver steam into a horizontal steam main next the well between the boiler and turbine rooms, and from this is fed a steam bus across the turbine room so that each generating set can be reached by a short connection. This sectionalizes the piping effectively and obviates the need for a multiplicity of steam leads into the turbine room. In connection with the turbo-generators it is worth noting that an air-spraying equipment with a capacity of 50,000 cu. ft. (1415.8 cu. m.) a minute is provided to condition the ventilating air for the generators. Another striking evidence of the magnitude of the work is found in the switchboard and feeder equipment. To this strictly electrical work

is devoted a four-story bay of which the electrical arrangement was shown in our previous article. The interesting point about it is that it actually provides for more feeders and switches than the great hydroelectric plant at Keokuk, one of the biggest in the country. So much for the necessities of a great and intricate industrial load. To secure immunity from the danger of switchboard troubles the whole system has been isolated with particular care, every oil switch being housed in a compartment of its own, and the commercial lighting and street-lighting equipments are also thoroughly separated. Similarly the 2300-volt and 13,200-volt bus systems are completely separated from each other, and each is provided with duplicate buses parted from each other by fire walls. From the 2300-volt busbars are served the six 750-kw. transformers which feed the 22,000-volt system for the more distant part of the distribution. It is rare to see a more complete scheme for safety and continuity of service in a plant requiring from the nature of its load an unusually comprehensive feeder equipment.

The Increasing Use of Fuel Oil

THE great shortage of coal during the past winter impelled many plants to operate on fuel oil, until, as our article in the issue of last week indicates, in New England alone oil-burning plants reach an aggregate of nearly 100,000 hp. Fuel oil has come into use also in heating plants for ordinary commercial buildings, for public buildings, and even for private residences. Of course, in other parts of the country the use of fuel oil has been familiar; that it has not been more widely used is due to a complication of reasons, chief among which is the fact that its price has varied in an entirely erratic fashion owing to various familiar natural and artificial causes. If its use in a particular case turned out to be economical, it was always a question as to how long it would stay so. The present state of affairs, however, puts an entirely new phase on the matter. Not only is coal at a very much higher price than usual, but transportation from the coal mines has been extremely difficult. Fuel oil, however, comes into New England ports in tankers, which in the main have not yet been commandeered, and is distributed in tank cars which cannot well be used for other purposes.

The usual oil is chiefly so-called "topped" oil from the Southern or Mexican fields, oil from which the lighter distillates have been separated. It runs a little better than 18,000 B.t.u. per pound, about 150 gallons (567.8 l.) being equivalent to a ton of good steam coal. As regards the mere matter of price, when three years ago such oil could be obtained for about 2½ cents a gallon it was practically on an even footing with steam coal at the same period, at about $3.75 per ton. It now ordinarily costs about twice the figure just given and has run even higher, so that as regards fuel value it is safe to say that it is kept practically on a par with coal. There are, however, some very marked advantages in the use of oil as such, particularly in the matter of labor and general maintenance. If properly handled, it gives substantially smokeless combustion, although very sensitive to improper treatment in this respect. It also keeps the heating surfaces cleaner than coal and is very much easier to store and handle than solid fuel. The whole question of ash is also eliminated and the upkeep of the boiler room somewhat lightened. A very characteristic advantage is the ease and quickness with which boilers can be forced to the limit in their output and kept there for long periods if necessary, since there is no reduction due to necessary cleaning of the fires. The added output can be assumed very quickly, and if boilers have to be kept in reserve they can be kept hot by oil fuel at a minimum cost. This advantage is particularly striking in cases where the plant is completely shut down for the night and has to start up at full capacity in the morning, as in textile working.

With proper equipment there seems to be usually a gain in boiler efficiency from the cleaner and steadier fires furnished by the oil, as well as greater steadiness in the steam pressure owing to the uniformity of conditions. Last week we gave details of the results in typical plants, all of which show material improvement in the performance of the boiler plant and great advantages of convenience as well. In the long run the question is that of the relative cost and availability of the two fuels. With a thoroughly modern boiler plant burning coal the boiler efficiency can be kept at a point where the advantage of oil fuel is not conspicuous. We are rather inclined to the opinion that the most marked gains have resulted in substituting a thoroughly first-class oil-firing system for a rather indifferent coal-firing system. There are many instances, however, of this very kind, and they are furnishing perhaps the most advantageous opportunities for changing to the use of oil. Its employment in relatively small plants, as in heating apparatus, offers advantages of convenience not lightly to be put aside. They are perhaps more striking here than in big plants, and the use of oil even in domestic furnaces has very conspicuous advantages in cleanliness and ease of fuel supply. At present prices of anthracite oil look attractive, and if the oil supply from the Southern and Mexican wells can be well kept up it would seem probable that a large increase in oil firing is likely to take place. The chief difficulty is that the use of fuel oil on ships has grown enormously. The needs of the navy are enlarging very rapidly, and the price of oil is likely to soar.

The Coming Issues

LONG-SPAN construction, characteristics of commonly employed dielectrics, selection and arrangement of motors for woodworking and features of a steam plant built to supplement a large Canadian water-power development will be the basis of several articles to be presented in the ELECTRICAL WORLD shortly. The article on long-span construction will dwell on the problems that differ from those usually encountered in line construction and will contain the opinions of many prominent Pacific Coast engineers. The article on characteristics of dielectrics should interest designer and operator alike, as only through knowledge of their properties can dielectrics be properly applied to electrical apparatus. Central-station conditions will be reviewed in another article.

Central Stations Meeting War Demands

Great Volume of Business Pressed Upon the Companies—Labor Short and Materials High and Scarce—Many Men in the National Service—Power Famine at Niagara

ANNUAL reports made by the electric utilities to their stockholders carry this year strong reminders of the war, of the extraordinary economic conditions of the times affecting costs of operation and of the tremendous power business urgently pressed upon the companies. The great bulk of the properties are operating with forces depleted by men in the national service, and they are in effect turning their physical plants to such ends as the government authorities desire.

Niagara Falls Power Company

Significant of the shortage of power in a district where war industries are operating at high pressure is the statement of Stacy C. Richmond, president Niagara Falls Power Company: "It is confidently believed that double the present output of all the existing plants would soon be absorbed for at least the duration of the war."

"Throughout the year the demands on both companies for power were far in excess of the plants," says Mr. Richmond. "Practically a power famine now exists at Niagara."

The Niagara Falls Power Company, like all other properties, felt the influence of large sales and of heavy costs.

"Increases in production and sales by your companies," says the president, "resulted in substantial increases in gross revenues. The increases were more than offset by greater operating costs and by large increases in taxes."

As a further precautionary step it also was considered proper by this company to appropriate from surplus a substantial reserve against certain contingent liabilities, consisting in the main of possible further requirements under constructions which may be placed on recent war and excess profits tax laws.

The Niagara company calls attention to the expense of protecting both American and Canadian plants against lawlessness as one of the recent increases in operating cost. Military and private guards are stationed at the Canadian plant and private armed guards at the American plant. A protective inclosure has been built around the American plant.

Union Gas & Electric Company

The Columbia Gas & Electric Company, Charleston, W. Va., controls, among other properties, the Union Gas & Electric Company, Cincinnati.

Among the property developments of the year, A. B. Leach, the president, mentions the fact that in order to guarantee an adequate coal supply the company acquired a one-half interest in the Wood Coal Company, Logan, W. Va. "The mine owned by this company," he says, "has a seam of the highest quality steam coal and is sufficient to meet the coal requirements of your company's subsidiary properties for many years."

As indicating the favorable prospects for the electric business of the Union Gas & Electric Company, it is stated that a third 30,000-kw. turbo-generator has been ordered for delivery in 1919 for the new power plant, making a total capacity of 90,000 kw. Notwithstanding numerous delays due to congestion in manufacturing and railroad deliveries, the new plant is nearing completion.

Detroit Edison Company

Alex Dow, president Detroit Edison Company, observes in the report of that company that during the latter months of 1917 there was a persistent change in the products of the principal industries served from those of peace to those of war.

"The earlier manufacture of munitions for export was comparatively small in this territory," says Mr. Dow. "It is now an important part of local industry and is apparently to become more important. The change has been made thus far, and continues to be made, with no apparent effect on our sales of energy. Up to the end of the year 1917 there had been no notable addition because of munitions manufacture to the demands upon us, the work in progress being done by diversion of existing power supply to the new uses. Our increase during 1917 has been due to natural growth."

In speaking of the increase in operating ratio from 54.5 per cent in 1916 to 63.8 per cent in 1917, Mr. Dow says that this is due to increased coal cost. "We are paying higher wage rates, and everything going into operating expense has increased seriously in cost. But by careful management and with the loyal help of our employees we have been able to keep all expenses, excepting fuel, down to a reasonable proportion of the earnings. Coal, however, has cost out of all reason and has been scarce and of poor quality, notwithstanding its high price."

Mr. Dow pays a fine tribute to the men who have responded to the call to arms. Many of the younger employees have gone. The total number who had joined the colors to Dec. 31, 1917, was 311.

Now senior skilled men, whom it is difficult or impossible to replace, are being taken by the government for special service.

"Thus far," Mr. Dow adds, "we have not asked for exemption of any employee, and we wish to avoid doing so. Neither have we filled all the vacancies. We have asked our operating employees to close their ranks, so far as practicable, behind the men who went out, and they have loyally done so."

An example of what it has been possible to do is cited by Mr. Dow: "We have been able, without losing the good will of our customers, or without impairing service, to do away with some of our routine—for instance, since midsummer we have been rendering bills to our Detroit residence customers for two-month periods, instead of for one-month periods, as formerly,

but the necessary work is being done with a less number of employees, both relatively and actual."

One effect is that the company is paying higher average wages in every operating department, partly in recognition of increased cost of living and partly in recognition of increased efficiency.

Mr. Dow notes, in speaking of construction expenditures, that the net increase of plant investment during the year was $8,069,496. This, though the largest amount expended by the company in any one year, is less than it was planned to spend. Much new work has been deferred indefinitely. Construction was accomplished under difficulties, labor costs were high, materials costly and scarce, machinery under contract for delivery has been delayed to give right of way through shops for United States requirements, and even weather conditions have been adverse to quick and cheap construction.

Among the larger items of construction deferred indefinitely, Mr. Dow mentions, is a proposed new power plant on the St. Clair River south of Port Huron. Steam turbines and boilers purchased for this plant will be put in storage for the present.

The policy as to line extensions is: "We have latterly refused to make any considerable extension of lines, excepting for supply of power to factories undertaking government contracts. Our intention is to carry out our engagements made before the war and to connect business on existing lines up to the capacity of these lines and of our power plants; but, excepting for extensions for national service, as stated above, and excepting the few cases where a refusal will work very great hardship, to decline to make line extensions."

Reverting to the change in character of industry from peaceful uses to war orders and stating that additions to existing factories and numerous new factories being erected are, with few exceptions, to be devoted to war-material production, Mr. Dow adds: "It is our expectation, therefore, that our sales of industrial power, which are the most important part of our business, will be fairly maintained."

Gross revenue of the company increased 21.9 per cent in 1917 over 1916, and output 22.9 per cent.

Montana Power Company

John D. Ryan, president Montana Power Company, notes that in spite of disturbed labor conditions, interfering with mining and smelting operations, and affecting practically all large industries, there were substantial increases in lighting and power consumption in small towns and in other branches of the business. Gross earnings increased nearly 11 per cent over 1916.

About $3,600,000 was expended during the year for new construction. Some construction work suspended temporarily last October, owing largely to labor conditions, will be resumed and carried to completion in 1918.

Forecasting the new year, Mr. Ryan says: "The outlook for business in general in Montana during the year 1918 is very good. All of the principal products of the State will doubtless bring higher prices, and as a result we may expect the usual increases in the lighting and small power business of our branches and towns, as well as increased income from electrical operations of railroads and the larger power business, which we estimate will more than offset the probable increases in higher cost of labor and materials and any increase in taxes."

Effect of War on New York Companies

The annual report of the Consolidated Gas Company, New York, for 1917 refers generally to conditions affecting its electric subsidiaries, which include the New York Edison Company and United Electric Light & Power Company, in part as follows:

The effect of the war upon the cost of producing and distributing gas and electrical energy has already been very disastrous and will be much greater during the present year than it was in 1917.

The price of practically all the materials and supplies required in the production and distribution of gas and electricity increased very substantially in 1917. The same was true of labor. The price of boiler coal used in generating electricity increased 59.2 per cent, and that of anthracite and bituminous coal used in gas manufacture 11.3 per cent, the average increase in the price of all varieties of coal used amounting to 34.3 per cent.

Coupled with the increase in the cost of coal has been the difficulty of obtaining it as well as a marked inferiority in its quality, causing an excessive consumption as well as impairing the capacity of the various plants.

As an insurance against any possible contingency which might interrupt the normal supply of coal, the lighting companies for years past have made it a practice to carry a large stock of coal on hand. This stock has generally been accumulated during the summer months, when shipping conditions were favorable. Mining and railroad conditions during the summer of 1917 were such, however, that the stocks of coal could not be brought up to the full quantities required and always theretofore maintained.

The increase in the cost of labor has also been very considerable, the principal causes for this being an extraordinary demand for men on the part of contractors engaged in the manufacture of war munitions and supplies, the building of cantonments and unusual activities in local shipbuilding yards, including the navy yards. The available supply was greatly diminished by the effect of the enlistment of a great many men in the army and navy and the conscription of many others.

Notwithstanding some improvement in the revenue from the sale of residual products, credited to the cost of gas manufacture, the increase in the combined operating expenses of the gas and electric companies amounted to $9,336,003, including the increase in taxes ($1,486,626) and the increase in operating expenses due to the greater quantity of gas and electricity sold ($2,413,332).

More than 1050 employees of the Consolidated Gas Company and its affiliated gas and electric companies are now serving in the army and navy, representing every grade of employment from departmental superintendents to day laborers.

The technical and engineering departments were particularly affected in this respect, the demand for the services of men thus qualified and the inducements offered them to join the various branches of the service having resulted in a great many enlistments. In the various clerical departments the difficulty of obtaining men to fill the vacancies thus caused resulted in the employment of many women, who are performing their duties in an entirely satisfactory manner.

When the first Liberty loan 3½ per cent bonds were issued employees of the Consolidated Gas Company and affiliated gas and electric companies were offered the privilege of paying therefor in installments. This privilege was availed of by 12,357 employees, who subscribed for an aggregate of $847,700. Similar action was taken in respect of the second Liberty loan 4 per cent bonds and 7478 employees subscribed for an aggregate of $511,750.

Sales of electric energy during the year, including sales to the Third Avenue Railroad, the Brooklyn Rapid Transit Company and the New York, New Haven & Hartford Railroad, amounted to 749,827,761 kw.-hr., an increase over the previous year of 11.37 per cent.

METHOD OF IMPROVING POWER PLANT ECONOMY

Reiteration of Principles Involved in Efficient Combustion of Coal, with Suggestions as to How This End Can Be Attained

ECONOMY in the use of fuel in power plants was discussed recently before the sanitary section of the Boston Society of Civil Engineers by C. H. Parker, superintendent of the generating department, Boston Edison company. He emphasized the importance of even a 1 per cent saving in the 32,000,000 tons of bituminous coal which the Fuel Administration estimates New England uses yearly, pointing out that this would release one 10,000-ton collier for a year and that the railroads could release 6400 50-ton coal cars one trip a year for other work as a result.

The first part of Mr. Parker's remarks referred to principles of efficient combustion. This was followed by a number of practical suggestions bearing on plant economy. He pointed out that there are many plants where substantial savings can be made and very few plants where no saving at all can be effected. The loss due to combustibles in the ash, the speaker pointed out, depends on the type of grate or stoker and the care taken by the firemen in firing and cleaning the fires. This loss may amount to 10 per cent of the heating value of the fuel. The openings in the grate or stoker should be proportioned to the kind of coal to be used, a non-coking coal requiring smaller openings than a coking coal. It is often possible to save a lot of the siftings, especially with stokers, by installing proper hoppers or pans to catch them and keep them free from the ashes. A periodical examination of the ashes carted away was suggested.

The loss due to water in the coal is twofold. First, if coal containing moisture is purchased it is very expensive, as each per cent of water means that a certain percentage of coal paid for cannot be utilized thermally. Second, the moisture has to be evaporated and superheated to flue temperature. Together these considerations mean about 1.1 per cent loss for each 1 per cent water in the coal. Sometimes it is helpful to wet the coal just before firing on ordinary hand-fired grates to prevent the rapid release of the volatile hydrocarbons and give them a chance to be consumed also. On some overfeed stokers wetting may prevent excessive sifting. In each of these cases the loss due to evaporation and superheating to flue temperature is present, but the other gains more than offset it. The water acts only in a mechanical way and adds no heat.

The loss due to visible smoke is usually very small, rarely reaching 1 per cent of the coal fired, but dense smoke quite often means bad conditions elsewhere. If the coal is fed in excessive quantities, considerable hydrocarbon may be liberated without being burned. Smoke may also indicate too small a combustion chamber. A smoky chimney, however, may be more economical than a clear chimney if the latter is obtained by excessive air dilution.

Standby losses may be considerable in plants having a fluctuating load. They consist of (1) coal required to start up cold boilers, (2) coal used to bank fires during shut-down periods, (3) heat lost in shutting down boilers, and (4) heat lost in water blown off to get rid of mud and scale from mud drum. The magnitude of these losses is dependent on the character of the load that is carried. Where boilers are not needed for more than twenty-four hours it is usually cheaper to let them go out and build new fires rather than bank them.

Flat grates are fired by hand satisfactorily up to 150 hp. rating on return-tubular boilers and up to 300 hp. on water-tube boilers. Above these sizes smokeless combustion is difficult without special arrangements, such as Dutch ovens, the Chicago settings or steam jets.

Steam jets pointed downward to force extra air over the fire at the front wall, through the side walls, or even through the bridge wall, and mix it with the volatile matter from the coal often produce good results by improving the efficiency and reducing the amount of smoke. Unfortunately, when the operation of the jets is left to the fireman results as good as those from tests are not always obtained. The jets should be used only while the volatile matter is being liberated and should be shut off afterward until the next charge of coal is fired. Steam air injectors can be made automatic and therefore independent of the fireman, but they need adjustment to obtain the best economy.

The Difference in Coals

Semi-bituminous coals, such as New River, Pocahontas, Clearfield, etc., work well with a fire 12 in. to 14 in. (30.5 cm. to 35.5 cm.) thick, and should be fired every ten or fifteen minutes. The more volatile coals used in New England are harder to burn efficiently and the fires should be thinner. With our most volatile coals the fire should not be more than 7 in. or 8 in. (17.75 cm. to 20.3 cm.) thick. The thinner the fire the more often should coal be put on.

Interest on the investment, depreciation, repairs and power for operation cost more with mechanical stokers than with hand firing, but mechanical stokers make possible the use of poorer fuels with efficiency as high or higher than is obtainable in hand firing with better grades of fuel. All underfeed stokers can burn the cheaper grades of coal economically, and one man can fire 3000 hp. or 4000 hp. of the inclined type, but not so many of the horizontal type, where hand cleaning is necessary. At the present time, however, unless an addition to plant is required by reason of increased load, the question of fuel saving resolves itself into the best use of the existing plant rather than replacing it with new, as the costs are very high and deliveries cannot be made for a year or more in many cases.

A control panel centrally located, with all of the meters and controls for the operation of one or several boilers mounted on it, is worth its cost, as the stoker operator can tell at a glance what fires need attention and what ones are operating satisfactorily. Without this a man must move continually from one fire to another for inspection of the conditions that exist.

A log sheet showing the starting and stopping of machines and boilers, pressures, temperatures, vacuums and loads carried is wasted effort and material unless it is studied and the facts discovered are acted upon for increasing the efficiency.

Where coal is very expensive or there is not exhaust steam enough to heat the feed water economizers are of advantage. When high boiler pressures are used, resulting in high flue-gas temperatures, they result in considerable saving. In existing plants where boilers are poorly designed and have to work at heavy over-

loads, it might be cheaper to increase the capacity by installing economizers than by adding more boilers.

Some plants are called upon to carry considerable overloads for a short time, either periodically or occasionally. Forced draft will often save fuel and money in such cases. If these periods are frequent it may be advisable to install the more expensive fan equipment, as that will only use 2 per cent to 4 per cent of the steam; but if these occasions are few, it is cheaper to install a steam air injector that may use from 5 per cent to 10 per cent of the steam or more. The standby losses of boilers, such as banking, are considerable, and if boilers have to be kept banked for long periods to cover a few emergencies, auxiliary forced draft will be found advantageous.

The steam loop is a simple means of returning the condensation in piping to the boiler and is adequate for small stations. In plants of several units, however, it does not work so well and the drip return system may be used. By these means all high-pressure drips are saved and the bleeder steam from the nozzle in the upper tank can be put into the feed-water heater and the heat saved. The exact saving depends on the men operating the plant and what wastage of steam would be allowed from drips if the automatic arrangement were not used.

Assuring Satisfactory Fuse Operation

Proper Installation and Renewal of Transformer Fuses Are Essential to Good Service and the Protection of Apparatus—Necessity of Standardization of Fuse Types

THE transformer fuse is usually looked upon as a necessary evil; it is purposely made the weak link in a system in order to protect by its weakness other more important apparatus. But this weakness must be dependable and predetermined. A fuse failure means either premature failure or incomplete failure; the first results in poor service and the latter in destruction of apparatus.

No transformer fuses would be used if other more dependable apparatus could be installed at a permissible price. However, so long as conditions and available apparatus remain as at present, distribution transformers of moderate size must be fused; hence means have to be devised for obtaining the best possible results from an admittedly recalcitrant device.

Among things essential to the satisfactory action of transformer fuses are proper installation, in the first place, and proper renewal of fuse elements at all times. Transformer fuses are often blamed for shutdowns and apparatus burn-outs which are really the results of incorrect renewals rather than of inherent fuse troubles. Many of these troubles will be eliminated if employees are carefully supervised in handling fuse renewals and furnished at all times with proper materials.

The equipment of every troubleman engaged in this class of work should include a suitable container for fuses. If this is standardized and extra sets, completely filled, are kept in stock at headquarters, emergency demands will be more easily met. A fuse kit used by one company in the far West is shown in an accompanying illustration. This company operates 2300-volt and 11,000-volt distribution circuits. The 2300-volt link fuses for the ordinary transformer insulator-type cut-outs, together with larger sizes for expulsion-type installations, are placed in the lower partitioned section of the case, while the 11-kv. fuses are contained in waterproof cylinders carried in an upper tray. A pair of rubber gloves, extra expulsion fuse holders and a treated wood puller complete the outfit. A fuse puller of the pincer type is to be preferred to those with spring metal jaws, first because of the absence of metal and secondly because the wood type may be used for pulling fuse holders of a variety of sizes and affords a positive grip on any.

To avoid mistakes in selecting fuses, a stamped aluminum plate is soldered to one end of each fuse compartment, showing the size fuse contained therein. A number tag is fastened to each 11-kv. cylinder for a similar purpose. To the inside of the fuse-kit cover is attached a printed schedule of the fuse sizes required with the various types of transformer stations used on the system. This information is considered especially important since troublemen stopping to figure the proper size may make serious errors.

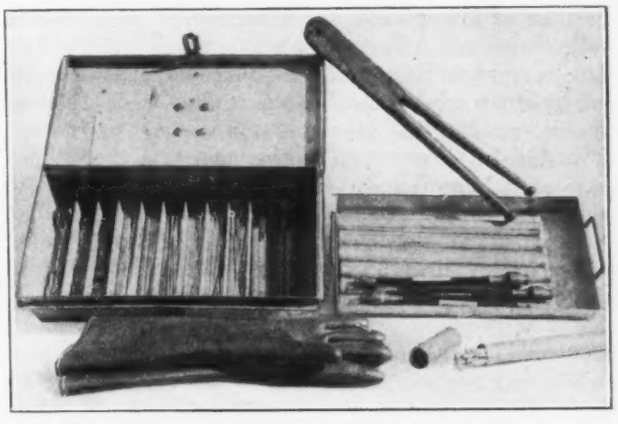

FIG. 1—CABINET THAT AVOIDS WRONG SELECTION OF FUSES

The box is constructed of No. 24 gage galvanized sheet iron. The upper tray and the partitions in the bottom are of No. 26 gage, while the tubes are No. 30 gage. The upper edge of the case is reinforced with ¼-in. (6.4-mm.) round iron, and the edge of the cover is similarly reinforced with 3/16-in. (4.8-mm.) stock. The box measures 18 in. by 9 in. by 5½ in. (45.7 cm. by 22.9 cm. by 13.9 cm.). The bottom partitions are 1¾ in. (4.4 cm.) deep. The tray is 17½ in. by 8½ in. by 2¼ in. (44.4 cm. by 21.6 cm. by 5.7 cm.) and rests directly on the lower partitions. The cylindrical containers for 11-kv. fuses are 14 in. (35.6 cm.) long and 1¼ in. (3.2 cm.) in diameter.

The company employing this box ordinarily fuses 2300-volt transformers for double load and 11-kv. transformers for from 50 to 60 per cent overload. The intention is to protect 2300-volt transformers primarily

against short circuits, while 11-kv. transformers are given what is as nearly an overload protection as is possible with the use of fuses and consistent with good service. Obviously the higher the overload for which transformers are fused the better the guarantee against interruption to service, but on the other hand the transformer protection is reduced. Consequently the lower-priced lines of transformers are fused for larger percentages of overloads than the higher-priced.

SIZES OF FUSES FOR 1-TO-100-KW. TRANSFORMERS RECOMMENDED IN FUSE-KIT LIST—FUSE RATING IN AMPERES

Size of Each Transformer (Kw.)	2300-Volt			11,000-Volt			
	Single-Phase	Open Delta*	Closed Delta	Single-Phase	Open Delta*	Closed Delta	Three-Phase Transformer
1	1	1	1	2	2	2	2
3	3	3	3	2	2	2	2
5	5	5	5	2	2	2	2
7½	10	10	10	2	2	2	2
10	10	10	15	2	2	2	2
15	15	15	20	2	3	3	2
20	15	20	25	3	3	5	2
25	20	25	30	3	5	5	2
30	25	30	40	5	5	8	2
50	40	60	75	8	10	12	5
75	60	75	100	12	12	15	5
100	75	100	100	15	15	20	8

*Middle lead. Outside leads same as single-phase.

It is evident from the accompanying table that 11-kv. transformers of less than 15 kw. are protected against short circuit only and not against overload, the reason being that 11-kv. fuses smaller than 2 amp. are very unreliable and not recommended for practical service. The practice of using larger fuses in the middle wire of open-delta banks than in the outside leads may seem peculiar at first glance, and a refinement not justified by the wide variation in fuse performance and the fact that current in the middle lead should ordinarily be only slightly greater than in the outside leads. Nevertheless, practice has shown that a decided percentage of middle-lead fuses have blown, and this change has seemingly improved service without jeopardizing the equipment to any greater extent.

The insulator-type primary cut-out ordinarily rated by the manufacturers at 30 amp., while having certain disadvantages, is nevertheless so attractive as to price that it is standard with nearly all companies for small 2300-volt installations. In higher-grade installations expulsion fuses are used for 2300-volt service over 30 amp., and even in some cases for 20-kw. or 25-kw. transformers. Oil switches should be used whenever possible for installations over 75 amp.

The positive advantages of oil switches, such as reliability of action, ease of resetting and protection against single-phase operation, should lead to a careful consideration of this protective device for all transformer stations of any considerable size and importance. The last feature is particularly important where stations serve large groups of small three-phase motors not equipped with low-voltage and overload releases. A case is on record where one 11-kv. station consisting of three 30-kw. transformers and furnishing energy to twenty-one agricultural installations of 5 hp. each operated single-phase after blowing a fuse, causing the burning out of seven of the motors.

Companies operating close to the coast or under other severe conditions experience much difficulty due to the corrosion of the fuse links in the ordinary transformer plug cut-outs. This has been somewhat obviated by the use of fuses with copper terminals protected by asbestos sleeves. Under especially severe conditions this type of fuse holder must be mounted on an insulator to prevent breakdown to the cross-arm.

Standardization of fuse types is a necessity, since every trouble car must carry renewals for every type used on the system. At present when central stations are purchasing whatever brand of transformer the market affords without regard to contracts, it is particularly necessary to insist on a standard. Some plugs so nearly fit holders of foreign type that repairmen will be tempted to use them, yet they will often loosen, owing to vibration, or give trouble due to poor contact.

When companies use expulsion-type cut-outs troublemen should invariably be cautioned not to make fuses of larger size by twisting smaller sizes together. Many repairmen take it for granted that two 10-amp. fuses twisted together will make a 20-amp. fuse.

Fuses of the inclosed-cartridge type for voltages of 6600 and up, consisting of glass, porcelain, fiber or treated paper tubes, are best made up complete in the shop and issued to the troublemen properly tagged as to size. While space in the trouble kit can be saved by carrying a stock of fuse wire and filling powder, uniform care is not assured in making up the cartridge. For this type of fuse glass is to be preferred to fiber or treated paper. Although the most recent product of the latter type shows very little tendency to warp in the weather, nevertheless there is more opportunity for failure by leakage than with glass, and the fuse tube may catch fire after blowing, owing to a heavy "short." In one instance a grain field was set afire and the flames were extinguished only with difficulty; in another case a brush fire was started. While it is true that the fragility of glass is a serious objection, nevertheless its qualities are such as to warrant its use until such time as a fireproof, non-warping, non-hygroscopic treated tube is produced.

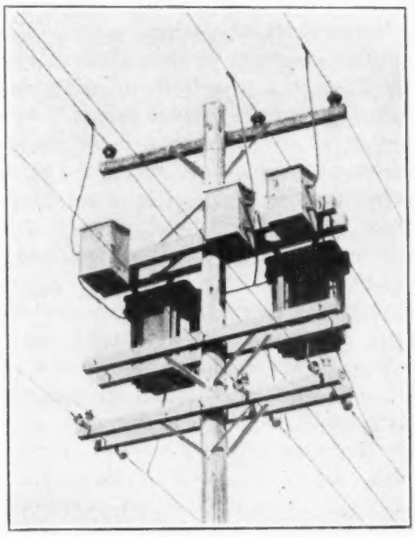

FIG. 2—FUSE INSTALLATION ON THREE-PHASE CIRCUIT

A cheap grade of gage glass is ordinarily used for fuses of this type. Breakage is of course to be expected, both in transportation and under short-circuit

conditions, but in any case the renewal cost is moderate. A good 11-kv. to 22-kv. fuse of this type can be made, as shown in Fig. 2.

Combination fuses and switches are now on the market at very reasonable prices and are favorable for voltages of 11 kv. and up. They may be easily arranged for operation from the ground. There is an operating saving in such construction, since it obviates the necessity of sending two men to renew a fuse, which would be advisable if the pole had to be climbed with the transformer "hot." With this equipment the renewal may be made with perfect safety by a single man, as the installation can be de-energized before the renewal is attempted. Furthermore, since the circuit is closed from the ground, there is no danger to the operator when a renewal is made under unsuspected short-circuit conditions. An added advantage of such an installation is that it permits an arrangement with the customer for cutting out transformers when service is not required, thus eliminating transformer losses.

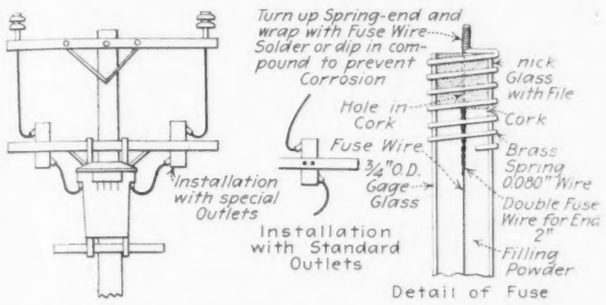
Turn up Spring-end and wrap with Fuse Wire
Solder or dip in compound to prevent Corrosion
Hole in Cork
Fuse Wire
¾"O.D. Gage Glass
Installation with special Outlets
Installation with Standard Outlets
nick Glass with File
Cork
Brass Spring .080" Wire
Double Fuse Wire for End 2"
Filling Powder
Detail of Fuse

FIG. 3—SINGLE-PHASE FUSE INSTALLATION AND DETAILS OF FUSE

The fuse consists of a gage glass ¾ in. (19 mm.) outside diameter by 17 in. (43.2 cm.) long with a ⅛-in. (3.2-cm.) wall. The ends are ordinarily corked; an aluminum fuse wire is brought out through a hole in the center of the cork and is soldered to a turned brass ferrule cemented to the end of the tube. A brass spring ferrule consisting of 0.08-in. (2-mm.) spring-brass wire turned up into a spiral of slightly smaller diameter than the glass may be used with a considerable saving over the solid ferrule. There is less metal and less labor in manufacture, placing on the tube and removal from broken tubes. In addition, attachment of the fuse wire is simplified. The end of the glass tube may be nicked with a file to obviate any possibility of the spring slipping off. The fuse wire should be doubled for the first few inches at each end of the tube so that it will be sure to blow well within the tube and also to assure good conductivity where the wire is most subject to injury. The end of the spring where the fuse wire is twisted around should be dipped in solder or, if a good aluminum solder is unobtainable, in compound to prevent corrosion.

Companies employing expulsion-type fuses mounted in wooden boxes will do well to give careful attention to box construction. Boxes which will not withstand the weather should not be used, because they will cause disastrous pole fires and line failures unless frequently inspected and repaired. A good box may be constructed of 1-in. (2.54-cm.) poplar painted inside with P. & B. and outside with three coats of a good pole paint. Boxes of this type are ordinarily constructed with one lead at the upper left side and the other at the lower right. This scheme may be improved upon by drilling an upper and a lower hole in each side of the box. The bushings and leads being readily removable, either upper hole may be used in conjunction with either lower. Thus four combinations are possible, and that which will give the neatest installation may be used in any case.

A typical single-phase installation is shown in Fig. 3, in which conditions are improved by using upper right-handle and lower left-handle holes on one side and vice versa on the other. In some three-phase installations (Fig. 5) the best arrangement is secured by placing both bushings on the same side of the box. The practice of sometimes attaching the line wire to the upper and sometimes to the lower terminal should be discouraged, as this may lead to an accident. Where four holes are drilled in the boxes two pieces of sheet fiber should be sent out with each box to be used in closing the unused holes. This is necessary not only as a protection against the weather but also to prevent the entrance of birds. In this connection it may also be noted that if the bottom of the box contains a hole through which the expelled gas is blown, a wire screen covering should be used with a mesh small enough to exclude bees.

In installing boxes of this type they should be placed on the transformer arm and not above, and should be mounted on the back of the arm, so that they will be accessible to the troubleman without the necessity of passing by live apparatus. It is often advisable to use leads insulated for the full line voltage from the point where the main line is tapped to the transformer terminal. No. 6 seven-strand annealed copper wire with a 16/64-in. (6.4-mm.) 30 per cent Para rubber covering and single-braid and tape covering over all makes a good 11-kv. lead. Some troublemen do not understand that as long as one fuse remains in place pressure is maintained through the transformer windings, and consequently all transformer terminals are energized. This matter should be called to their attention.

A record of transformer fuse renewals is of considerable value in reducing transformer burn-outs and improving service. For this purpose a 3-in. by 5-in. (7.6 by 12.7-cm.) card of the form shown in Fig. 4 has been used with success by one company for a number of years. There are many cases in which the cause of the fuse blowing is never known. It may be taken for granted, however, that repeated blowing indicates an incorrect condition which should be investigated. This company having all transformer stations appropriately numbered files the record cards in numerical order, and whenever three blown-fuse cards appear against one station within two years an investigation is made, particularly with reference to overload or defective customers' installations. The card also serves as a check on the installation of fuses of proper size.

Report of Primary Transformer or Line Fuse Blown

Station ~~or Switch~~ No. 365 Location Columbia & H

~~11,000~~ 2,300 Volt Fuse Blown at 8 30 ~~A. M.~~ P. M.

Installed 10 Amp. Fuse in ~~Outside~~ Middle Lead

CAUSE OF TROUBLE WAS AS FOLLOWS:

Fuse Block Burned Up	Motor Trouble
Overload	Miscellaneous
Short in House	
Primary Down	
Secondary Down X	
Lightning	
Date 9-4-17	Trouble Man A. Smith

FIG. 4—RECORD OF TRANSFORMER FUSE FAILURE

Everybody Doing It—Buying Bonds

Light Projection with Gas-Filled Lamps

How the Lamps and the Optic System Used Therewith Have Been Sympathetically Developed So that It Has Now Become Possible to Make Satisfactory Use of Them for Motion-Picture Projection

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THE application of incandescent lamps to purposes hitherto served by carbon arc lamps has been considerably extended by the development of gas-filled lamps. The carbon arc for street and industrial lighting, and for nearly every application with the exception of projection, has been replaced by the incandescent lamp. For a time it was believed that the incandescent lamp would never replace the arc in projection lighting, especially as applied to motion-picture projection, because of its inherent limitations. The principal limitation was the relatively low intrinsic brilliancy of the source. If only the common types of incandescent lamps and the usual optical systems are considered, the limitation still holds. However, new incandescent lamp constructions and a sympathetic design of the optical system have made it possible to overcome obstacles that formerly existed. It is reasonable to expect that in a few years incandescent lamps will be as widely used in this field as in others previously dominated by the carbon arc.

Viewed from practical and commercial standpoints, optic projection has many complicated features. In the past the arc, the source most widely used for light projection, has been commonly, though incorrectly, considered a point source. Light projection with arc lamps has been accomplished with varying degrees of success, due chiefly to the high brilliancy of the arc and less to the efficiency with which the light is utilized. With gas-filled lamps the brilliancy is limited to about one-fourth that of a good direct-current arc, so the success with which the light is projected depends upon the utilization of the light. This is of the utmost importance in the use of gas-filled lamps for projection purposes.

An optical projection system may be divided into three parts and each considered individually, and then all considered collectively. They are the source of light (including mirror), the condensing lens, and the projection lens (or objective). They are related as follows: The condensing lens gathers the rays of light from the light source and redirects them through the image—film or slide—to be projected to the projection lens, which in effect enlarges the transparency on the screen. In general, the shorter the rear focus of the condensing lens (distance betwen lens and illuminant) the more light the lens will gather and redirect.

Limitations to the Effective Use of Gas-Filled Lamps

Limitations upon the efficiency of this operation follow:

I. Too short a rear focus will give too great a thickness of lens, which (a) increases absorption, due to its thickness and internal reflection; (b) gives poor definition, due to spherical aberration; (c) gives color, due to chromatic aberration.

II. Too short a rear focus will require light rays to strike the lens surface at too great an angle, increasing the surface reflection and causing a loss of light.

The light source may be considered from four viewpoints—brilliancy, size, construction and wattage.

I. Brilliancy.—Brilliancy is limited by (a) life of filament—the higher the temperature, the shorter the life and the greater the candle-power emitted per unit area of filament; (b) diameter of filament—in general, the greater the diameter of filament the higher the operating temperature for the same life.

II. Size of Source.—With condensing lens and projection lens given, there is an area of source which if increased will decrease the efficiency of utilization. It should be understood that a larger size of light source can be used, but that that portion of the source which

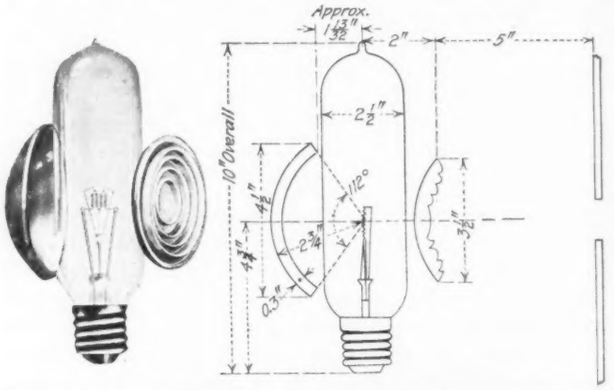


FIG. 1—RELATIVE POSITIONS OF GAS-FILLED LAMP, MIRROR AND CONDENSER FOR PROJECTION PURPOSES

The filament is wound in the form of four parallel helical coils lying in the same plane. The distance between the coils is slightly more than one-half the diameter of the coils. The lamp is designed for operation on circuits regulated for current rather than for voltage. It is made for operation with the tip end of the bulb uppermost, has a maximum over-all length of 10 in. (25.4 cm.), and a light-center length—the distance from the extremity of the base to the center of the light source—of 4¾ in. (12.2 cm.). The bulb is tubular and of such length that the fine particles given off by the filament are carried upward by the hot gas and deposited on a portion of the bulb well out of the zone of useful light. The rated average life is 100 hours. The mirror is backed with a heat-resisting material to withstand 125 deg. to 150 deg. C.

falls outside the dimensions determined by the character of the optical system is used much less efficiently than that falling inside the dimensions.

III. Construction of Source.—The construction or form of the source governs the distribution of light, which in turn limits the amount of light which can be used by the condensing lens.

IV. Wattage.—The wattage is limited by (a) size of light source; (b) construction of light source; (c) the diameter of filament.

The purpose of the projection lens (that nearest the screen) is to gather the rays which have passed through the film, redirect them to the screen and thus produce the size of picture desired. The larger the size of this lens, the greater will be the amount of light

projected, but the loss of definition and the high cost of large lenses of this kind limit the size to be used.

No doubt, the most radical change in lamp design, although not an entirely new development, is the use of the so-called "monoplane" type of lamp filament (Fig. 2), which is so arranged that all of the coils are in one plane, so to speak. This construction allows most of the filament to come within the focus area of the lens system to a much greater extent than obtains in the regular stereopticon lamps. In the latter the area occupied by the filament is greater and the coils, since they are not all in one plane, cannot all be close to the proper focus.

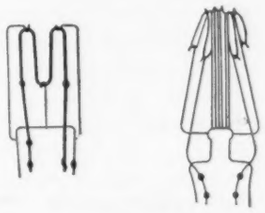


FIG. 2—MONOPLANE AND CONCENTRATED FILAMENT CONSTRUCTION

The light from the rear portion of the filament is gathered and redirected as useful light by a spherical mirror. The mirror is so placed that the filament is at the center of the outside radius of curvature of the mirror. With the monoplane construction images from the filament can be made to fall at points between the filament coils, thus giving a solid plane of light if the lamp and mirror are properly focused (Fig. 3). It is evident that to secure this effect with the stereopticon lamp filament would be impracticable, if not impossible.

Another characteristic feature of the new filament construction which is of great importance is the light distribution in a horizontal plane (Fig. 4). The light falls largely within angles at which the light can be utilized by the lens and mirror system. The advantages of such distribution should be evident.

It must not be inferred that the use of the monoplane filament construction is best adapted for all types of lamps for projection service. There are cases where some other type of construction may be used in order to obtain the size of source necessary.

It may be readily seen that if a large bulb were to be used to inclose the filament, advantage could not be taken of the short-focus condensing lens; consequently, it is necessary to use a bulb of as small a diameter as is practically possible. The size of bulb—that is, the area—is determined mainly by the wattage of the lamp. If the bulb can be made long and small in diameter—that is, tubular—the necessary area can be obtained with the advantage of the small diameter.

In obtaining concentration of filament it is necessary to get as high a wattage and filament brilliancy as possible for the size of light source previously determined. This can be most easily accomplished by the use of a large diameter wire, or, in other words, through the use of a high-current, low-voltage lamp. The high brilliancy of source desired is obtained by operating the filament at a higher temperature than is advisable for lower current lamps. At the same time, by the use of high current at low voltage, it is practicable to concentrate a higher wattage in the same size of source than if the lamp were designed to operate directly on 110-volt circuits. This low-voltage, high-current lamp is objectionable from one viewpoint, namely, that it cannot be used directly on regular lighting circuits. However, equipment can very readily be obtained for the operation of this lamp on lighting, power or isolated-plant circuits.

It has been found economical to burn the lamp at a high efficiency. It has also been found that where these lamps are used for long periods, say daily, as, for instance, where they are to replace the carbon arcs for motion-picture projection, the renewal cost on the basis of 100 hours' lamp life is comparable to the average cost of carbons, and though the cost of carbons may in certain cases be slightly lower, the reduction in wattage by the use of incandescent lamps with properly designed lens systems is such as to considerably more than offset this difference.

In order to utilize the maximum amount of light generated by the incandescent lamp, it is necessary to use a condensing lens with a short rear focus. The difficulties with this lens, as outlined before, were eliminated by the use of a prismatic lens of the Fresnel type (Fig. 1). This condenser utilizes a 76-deg. solid angle of light as compared to a 45-deg. solid angle with the arc-lamp condenser. The prisms are so designed and arranged as to make the condensing system as thin as possible and to distribute the light on the film so as to give an excellent "flat picture." The prismatic condenser is the most efficient condenser which can be used with gas-filled lamps at the present time, and it should be a part of every installation.

The correct operating positions of the lamp, mirror and condenser with respect to each other, with the various dimensions, are shown in Fig. 1. The spherical mirror performs two functions: (1) It utilizes the light from that portion of the filament farthest from the condensing lens, projecting the light back to the source and increasing the light on the screen from 50 to 75 per cent, depending upon the mirror used and the spacing between filament sections. (2) It fills in the space between the filament sections, thereby approximating a solid band of light.

METHODS OF INCREASING SCREEN ILLUMINATION

There is some uncertainty at present in the minds of theater managers as to how bright a motion picture should be shown. The tendency in the past has been toward brighter and brighter pictures, but to-day the trend appears to be toward pictures of moderate brightness. However, increased screen illumination can be obtained with gas-filled lamp equipment by the use of projection lenses with wider apertures. The wider the

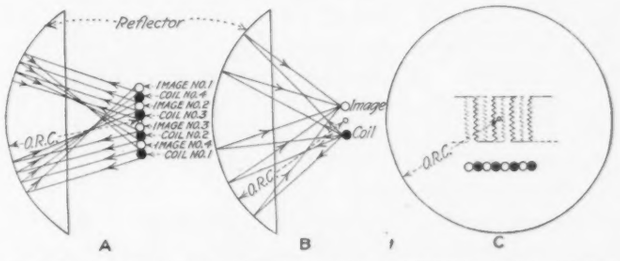


FIG. 3—IMAGE OF FILAMENT FALLS BETWEEN COILS GIVING SOLID PLANE OF LIGHT

aperture of the projection lens—that is, the larger the diameter of the opening of the lens—up to a certain limit, the more light there will be projected on the screen. It has not been entirely possible to gain this advantage with the arc projection owing to the fact that as the diameter of the opening of the projection lens is increased the magnification of the arc lamp flicker is increased. The change from a projection lens

of F-2.5 to one of F-2* opening, of the same equivalent focus, increases the illumination on the screen by approximately 100 per cent.

In certain instances a two-wing shutter will give an increase in illumination and yet not increase the flicker. Two of the reasons for the use of two-wing shutters

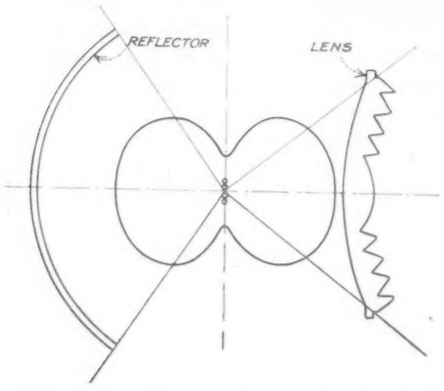


FIG. 4—DISTRIBUTION OF LIGHT FROM MONOPLANE FILAMENT

are as follows: (1) With light sources which do not pulsate in intensity—for example, with gas-filled lamp and the direct-current arc—either shutter may be used. Flicker may occur, depending on the speed of film travel on screen surface with the two-wing, but the efficiency of light transmission is rather better than with the three-wing. (2) With pulsating light sources, such as the alternating-current arc, there is a possibility of a bad stroboscopic flicker of very low frequency if certain relations exist between the shutter characteristic and the alternating-current frequency. The customary 60-cycle service and the three-wing shutter constitute the most common example of an objectionable combination. Hence two-wing shutters are usually employed with alternating-current arcs, since the 32-cycle flicker of the shutter is less objectionable than the flicker caused by the stroboscopic effect.

The type of screen to be used in the theater depends to a large extent upon the length of throw and width of the theater or any extreme angles at which the picture must be viewed. Metallic and selective screens offer a picture brightness of from one time to seven times that of white paint and muslin screens for a projected beam of equivalent power. However, metallic screens are limited in their application to the narrow theaters in most cases. It is possible to project a satisfactory 12-ft. (3.7-m.) picture on a white paint or muslin screen. The width of the picture projected can be increased to approximately 13½ ft. to 14 ft. (4.1 m. to 4.3 m.) when a good type of metallic screen or ground mirror screen is used.

CONTROL APPARATUS FOR GAS-FILLED LAMPS

Twenty-ampere, 28-30-volt gas-filled lamps, like incandescent lamps for regular lighting service, operate equally well on either direct or alternating current, with no difference in the light output. The operation on alternating current may be at any commercial frequency.

On direct current a motor-generator set or rotary converter with proper control equipment and ammeters is required to supply the lower voltage required by the gas-filled lamp. Of course, it is possible to use a resistance with a sensitive adjustment and an ammeter instead, but this method is not usually advisable because of the energy lost in the rheostat.

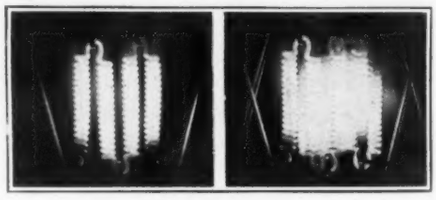
A transformer has been developed which can be used on 110-120 volt and 220-volt alternating-current circuits. This transformer includes a variable resistance, or a reactance, in the primary circuit to take care of the variations in line voltage, thus enabling the operator to maintain the normal current on the lamp. An ammeter is placed in the secondary circuit of the transformer, and a four-point starting switch is included in some equipments. This switch eliminates the possibility of a rush of current through the cold lamp when the current is first applied, for the connections are such that the current is gradually increased as the switch is turned from the "off" to the full-current position.

For use with the present arc-lamp transformers a panel attachment has been developed, which includes a rheostat for regulation, an ammeter, a reactance coil and the four-point starting switch.

At the present time there are on the market a number of transformers which are being used with the 20-amp. gas-filled projection lamp, but which are not recommended, although they are cheaper than the transformer mentioned above. They do not contain a variable resistance in the primary circuit to take care of fluctuation in the line voltage, nor do they include an ammeter. Thus the operator is not in a position to know whether his lamp is burning at, above or below normal current, which is very important with gas-filled lamps. In order to take advantage of all the light possible, the filament is operated at a temperature close to the melting point. Any marked increase in current delivered to the filament materially shortens the life of the lamp, and any decrease in current delivered to the lamp is followed by a loss in light on the screen.

ADJUSTMENT OF LAMP, MIRROR AND CONDENSER

A number of things must be done in order to place the lamp and mirror in the correct operating position. First, it is essential that the plane of the four parallel coils of the filament be perpendicular to the optical axis, which is an imaginary line drawn through the center of the screen, the projection lens, the aperture plate, the condenser, the lamp filament and the mirror. To obtain this condition the lamp should be put in the



FIGS. 5A AND 5B—FILAMENT ALONE AND FILAMENT WITH IMAGE BETWEEN COILS

relative position determined by the dimensions, then moved horizontally and vertically until the image of the filament coils can be seen very distinctly on a piece of white cardboard or paper held against the shutter wing in front of the projection lens (Fig. 5A). Then the mirror should be inserted, making the proper ad-

*This term is obtained by dividing the equivalent focus of the projection lens by the diameter of its free opening.

justments so that the mirrored image of the coils appears on the card as distinctly as possible in the spaces between the direct image of the coils, which is also on the card (Fig. 5B). Extreme care should be taken to avoid focusing the mirrored image over the direct image.

From the above discussion it will be noted that gas-filled lamps can be used for motion picture projection to the fullest advantage only when installed in connection with the proper mirrors, special condensing lens and good regulating equipment. The authors claim that, in general, wherever alternating-current arcs are at present in use the 20-amp. gas-filled lamp will, when properly installed, project pictures equal to or better than the arc lamp, with a considerable saving in operating cost. Furthermore, it can replace direct-current arcs rated up to 35 amp. and may be used for either motion picture or stereopticon projection work. A satisfactory picture can be projected with gas-filled lamps with a throw up to at least 90 ft. (27.4 m.). The permissible width of the picture to be projected will, of course, be affected by the character of the screen used. As previously mentioned, the type of screen and rating of the projection lamps used play an important part in obtaining the most satisfactory and largest picture which can be projected with this lamp.

In the past it has been the usual practice to endeavor to obtain the maximum screen illumination in projecting motion pictures, but the tendency at the present time is to decrease the screen illumination to a point where eye fatigue is entirely eliminated. The fatigue is caused by the sharp contrast between the white portion of the pictures and the darkness of the theater.

The intensity of the projected beam determines only the relative brightness of the picture. This may be understood when the different classes of screens are considered. The three common types of screens in use to-day are the matte screen, the metallic surface screen and the mirror screen with a ground surface. The percentage of illumination reflected by the above screen depends upon the type or surface of the screen.

The transmission efficiency of the various tinted and toned films in use to-day reduces to a certain degree the glare which would otherwise result from the high intensities if black and white films were used entirely. The tinted and toned films give a soft picture but absorb considerable light, about 20 per cent for light tinting and up to 80 per cent for some of the deep reds.

The screen illumination produced by gas-filled lamps is very uniform. There is neither travel of the light source nor source flicker, as in the case of the arc. The color values of the light from the incandescent lamp are desirable. Gas-filled lamps are entirely inclosed in metallic housings so that the heat is confined and the booths kept comparatively cool. Trouble with carbon dust deposits on the condensing lens is also eliminated. The reduction in operating expenses has been previously mentioned; the average renewal cost is slightly lower and the wattage required is much less. There is a further saving in the elimination of the warming-up process with its requirement of overload capacity. In fact, the simplicity of the gas-filled lamp is a feature which appeals to the operator. Once the lamp is placed in the projection machine, it requires no further attention from the operator until it burns out.

POTENTIAL GRADING ON SERIES LIGHTING CIRCUITS

Tests on Circuits in Chicago Park—Lighting System Shows Advantages of Operating Series Circuits Ungrounded

TESTS to determine the potential gradient and the location of the electrical center on a series street-lighting circuit with its last lamp 6 miles (9.6 km.) from the switchboard have been made by engineers of the electrical department of the Lincoln Park Commission under the direction of C. H. Shepherd, electrical engineer in charge. The circuit investigated consists of the following: One 37.5-kva., single-phase, 60-cycle, 12,000/2000 5000-volt Moloney transformer regulated by a 50-lamp Western Electric induction regulator rated at 7.5 amp. with the necessary "disconnects," oil-switch, instrument transformers, etc.; 104 gas-filled tungsten lamps rated at 400 cp., 15 amp.; two Kuhlman series-multiple 7.5/15-amp. transformers; 102 Westinghouse 7.5/15-amp. compensators; 63,360 ft. (about 19,500 m.) of No. 6 solid single-conductor paper-insulated lead-covered cable and 8440 ft. (about 2400 m.) of No. 6 solid single-conductor rubber-insulated triple-braided cable. The total length of the circuit was 71,800 ft. (about 21,900 m.). The inherent power factor of the compensator was 97.5 per cent, and the inherent efficiency of this unit was 93 per cent. The power factor and efficiency of the transformer were respectively 99.5 per cent and 94 per cent. The lamps are staggered on the cable, and both legs of the circuit are run in the same type of non-magnetic conduit.

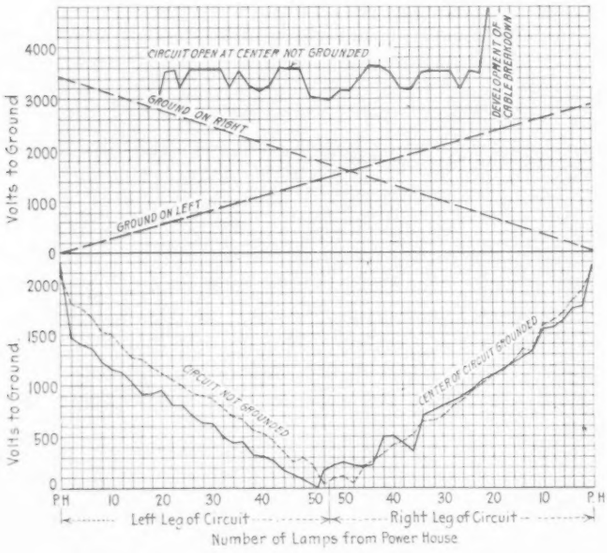
Tests were first made in the station by placing grounds at different points with the following results: With a ground at the station on the left leg of the circuit the pressure across the circuit was 2840 volts. With the ground at the station on the right leg of the circuit the pressure across the circuit was 3440 volts. The potential across the circuit with no ground on the circuit was 3540 volts; the potential to ground on the left leg of the circuit with no ground on the circuit was 1760 volts, and the potential to ground on the right leg of the circuit with no ground on the circuit was 1740 volts. These data showed that with one end of the circuit grounded at the power house the potential to ground was approximately 100 per cent greater at the other end than when the circuit is operated ungrounded.

Readings of potential from the line to ground were then taken at each lamp and showed that the potential gradually increased from 50 volts at the center of the circuit to 2160 volts to ground on the left and 2140 volts on the right leg of the circuit. These readings were taken without the line being grounded. The readings seemed to indicate that the end of the physical center of the circuit was also its electrical center. The circuit was then grounded at its physical center with a 15-amp. ammeter in the ground connection. The ammeter showed 2 amp. flowing to ground.

Readings taken from the line to ground with the line grounded showed that the electrical center of the circuit shifted and that the potential to ground increased at practically all points along the line. The potential across the circuit at the switchboard was 3500 volts, and the highest potential to ground proved to be at the switchboard, where the value was 2160

volts. At the lamp nearest the power house, which was practically 3 miles (6.4 km.) distant, the potential to ground was 1900 volts.

Curves plotted from the readings taken in these tests are shown in the accompanying curves. By reference thereto it will be seen that the potential gradient is almost uniform. This is due to the fact that there was during this test no ground on the circuit, allowing the neutral point to shift its position to compensate for changes in reactance on the circuit due to lamp burnouts, regulator movements and electrostatic conditions throughout the entire length of the circuit. The curves also show that with the apparent electrical center of the circuit grounded the potential gradient is unbalanced and not uniform owing to the fact that the neutral point is fixed by being grounded. Flexibility



VOLTAGE FROM SERIES CIRCUIT TO GROUND AT DIFFERENT POINTS UNDER DIFFERENT CONDITIONS

and freedom of adjustment of the ungrounded circuit in response to changes of electrostatic and electromagnetic conditions are thereby seriously hampered. The unbalance due to action of the regulator and to changes in electrostatic capacity due to variations in the specific inductive capacity of the various dielectrics used along the circuit are plainly apparent.

It was expected that the introduction of a ground at the apparent neutral point where a potential of only 50 volts to ground existed would reduce the potential at that point to zero and accordingly reduce the potential to ground all along the circuit. The ground was not placed at the electrical center, however, because the reading at the supposed middle lamp rose from 50 volts to 199 volts, while the potential to ground at a lamp three posts from the supposed center fell to zero. The maximum potential to ground on the circuit with the ground connection in place rose by amounts varying from 20 to 60 volts at different points. This apparently showed that grounding at a definite point does not reduce the maximum potential to ground, owing possibly to electrostatic conditions.

Grounding does, however, make it easy to locate trouble. With a ground at the electrical center of the circuit, it is apparent that should another ground occur on the circuit the lamps between the two grounds will not burn. It would be very easy, therefore, to locate the second or accidental ground which is the cause of the trouble.

In another test conducted in order to get an idea of the relative value of the induction and capacity of the circuit the cable was opened at its physical center. A potential reading at this point showed a value of 4500 volts across the ends of the circuit. Readings to ground were then taken at each lamp with the circuit open at its center. While this test was in progress trouble developed on the circuit at a little over 3000 volts, showing that at this low potential to ground a breakdown is possible under open-circuit conditions. The exact voltage conditions causing the trouble were not determined at the time because of lack of instruments. To all appearances, however, a great rise of pressure occurred, possibly due to a condition approximating resonance.

While further investigation of these conditions on the park circuits is still in progress, certain conclusions appear evident at present: First, better voltage conditions, less dielectric strain to ground and greater flexibility of adjustment appear when operating the circuit ungrounded. Second, grounding the apparent electrical center causes no apparent release of electrical strain nor decrease of pressure to ground, but on the contrary impairs the uniformity of the potential gradient and causes an unbalanced condition. Third, the advantage of quickly locating a ground made possible by a grounded electrical center is outweighed by the disadvantages caused by grounding, because a ground can always be placed on a circuit at the station quickly. Fourth, the practice of grounding one end of the circuit evidently makes a large increase in the dielectric strain to ground at the other end of the circuit. On the whole, it is thought the ungrounded circuit offers greater advantages than any system of straight grounding as far as operating conditions are concerned.

STATUS OF NON-WAR PROJECTS

War Industries Board, in the Public Interest, Will Discourage All Such Enterprises

Calling attention to the organization of new industrial corporations in different sections of the United States for non-war manufacturing and to the plans being considered by certain states, counties, cities and towns for construction and other improvements not contributing toward winning the war, the War Industries Board has passed a resolution indicating a firm attitude toward such projects. The resolution concludes:

That in the public interest all new undertakings not essential to and not contributing either directly or indirectly toward winning the war which involve the utilization of labor, material, and capital required in the production, supply or distribution of direct or indirect war needs will be discouraged, notwithstanding that they may be of local importance and of a character which should in normal times meet with every encouragement.

That in fairness to those interested therein notice is hereby given that this board will withhold from such projects priority assistance, without which new construction of the character mentioned will frequently be found impracticable, and that this notice shall be given wide publicity, that all parties interested in such undertakings may be fully apprised of the difficulties and delays to which they will be subjected and embark upon them at their peril.

New Bedford Company's 52,000-Kw. Station

Engineering Features of Steam Turbine Plant Which Supplies Textile District with Power and Is Interconnected with Other Utilities in Buzzards Bay and Cape Cod District

OWING to the difficulty of securing coal and the shortage of capital for industrial development, many textile plants in New England have been attracted to the use of central-station energy. In the Feb. 23 issue it was pointed out how these conditions have put an unusually heavy demand on the New Bedford Gas & Edison Light Company, which has endeavored to meet it by building a new 52,000-kw. steam station. Some of the factors which influenced the location and design of this plant were outlined, and engineering features of the coal-handling and boiler-room equipment were discussed. This article will dwell on the remaining mechanical and electrical features.

Piping Arrangements, Cooling of Bearings and Boiler-Room Instruments

Two 5000-hp. feed-water heaters are in service, each having a capacity of 150,000 lb. (66,035 kg.) of water per hour, with a range of temperature of 40 deg. to 210 deg. Both heaters are mounted on a gallery between the boiler-room and turbine-room walls, one heater being of Hoppes and the other heater being of Cochrane make. The feed-water piping is of semi-steel and is installed in duplicate to insure maximum flexibility of service. The feed-water supply is taken from a discharge well into which the condensate is delivered, make-up water coming from the city mains, which enter the premises by two lines, on opposite sides of the property, with cross-connections between. Copes feed-water regulators are installed.

A portion of the water from the hot well is circulated through the bearings of the turbo-generators instead of relying entirely upon city water for this service, thus securing a decided economy in the consumption of the latter. After leaving the bearings the water is returned to the hot well, from which it is drawn into the feed system of the boilers. The feed pumps consist of four Terry turbo-driven Janesville units, rated at 250, 350, 500 and 1000 gals. (946.3, 1324.8, 1892.6 and 3785.3 l.) per minute respectively. A service pump of the same make, driven by a 15-hp. Terry turbine and capable of handling salt water at the rate of 200 gal. (257 l.) per minute, is also provided for wetting down ashes and for lavatory supply. This, with a Westinghouse locomotive-type air compressor for general service, is installed in the basement of the boiler house near one of the forced-draft fans.

Each boiler is equipped with a General Electric steam-flow meter of indicating and recording type, two Ellison draft gages showing conditions above and below the fire, an indicating steam-pressure gage, Foxboro steam-pressure and temperature recorder, a Hohmann & Maurer indicating flue-gas thermometer, and two Bailey feed-water flow and temperature recorders, one for each heater. A Lee V-notch meter is provided for checking the feed-water measurements.

Each pair of boilers delivers steam into an overhead cross line which joins a horizontal main running parallel to the fire-wall separating the boiler and turbine rooms, the main being supported on saddles about 36 in. (91.4 cm.) above the boiler-room floor. Ample provision has been made for expansion loops. Long-radius curves are provided in the piping between boiler batteries and in the risers which take the steam from the main to the various generating units. Instead of running a separate steam line to each of the 4000-kw. units a single branch or steam bus is run from the main across the turbine room at right angles to the axes of these generating sets, a short connection being made with each.

This arrangement sectionalizes the turbine piping, giving the station one main live steam connection for each unit of 10,000 kw. rating or more, and avoiding the use of a greater number of small-capacity steam leads into the turbine room. From the steam-supply standpoint, therefore, the three smaller turbines may be treated as a single unit, although each machine is provided with an individual stop valve between the branch main and the turbine inlet. Blind flanges are left in the cross steam connections leading to the main for the attachment of feeders from boilers on the opposite side of the firing aisle as the new boilers are added.

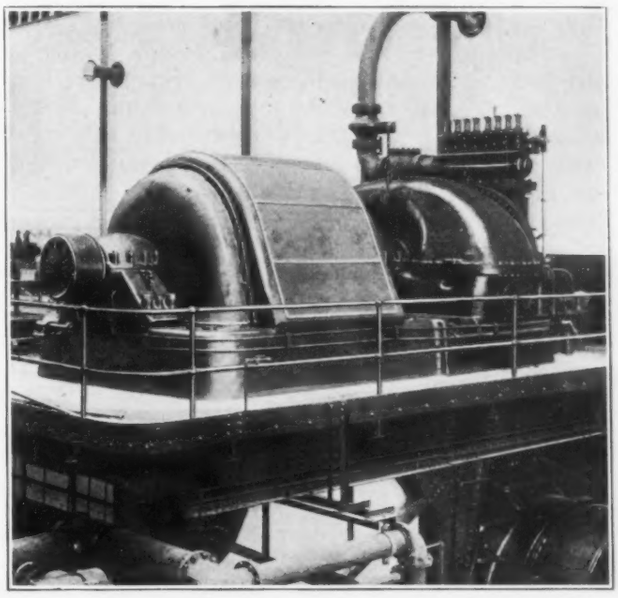


FIG. 1—CONDENSER AUXILIARIES ARE SITUATED IN PIT AT RIGHT

The condensing water tunnels run under the turbine-room basement, the intake, discharge and air duct leading to the generator being combined in a single reinforced-concrete structure. Cleaning of the screens is accomplished by raising sections out of the grooves in which they are seated, the lifting being accomplished by a 1-ton Sprague traveling electric hoist, which runs above the screen bulkhead. A small shelter is provided at one end of the crane runway to house the hoist when

it is not in service. The circulating water is drawn from suction wells built into the station foundations.

All of the condensers are of the surface type, the 10,000-kw. and 15,000-kw. units being Worthington equipment supported on springs with copper expansion joints. At the time when the 10,000-kw. turbo-generator was purchased it was felt that the Worthington hydraulic air pump was in the development stage, so a Laidlaw-Dunn-Gordon reciprocating dry-air pump was provided for this unit and the first 15,000-kw. set. The second 15,000-kw. unit will be equipped with a Worthington hydraulic air pump of the centrifugal type, however, as will also one 4000-kw. unit. These pumps are much more compact than the reciprocating type and permit the use of steam-turbine drive, which eliminates oil in the exhaust steam. Maintenance is reduced as compared with a reciprocating pump, and the number of working parts is less. While nearly twice as much steam is required as with a reciprocating pump, the utilization of the exhaust with an efficiency of about 80 per cent makes the actual consumption of steam of minor importance.

Two of the 4000-kw. turbines are equipped with Alberger surface condensing sets transferred from the old station. All of the circulating pumps are driven by Terry turbines. Worthington hot-well pumps are provided with the later units. By the use of Falk reduction gears for driving the centrifugal circulating pumps higher turbine speeds are obtainable, resulting in approximately 50 per cent increased auxiliary steam economy. A representative speed reduction is from 2800 r.p.m. on the auxiliary turbine to 460 r.p.m. at the pump shaft.

The condenser for the 10,000-kw. unit has a capacity for liquefying 130,000 lb. (59 kg.) of steam per hour, the capacity of the circulating pump being 19,000 gal. (71,921 l.) per minute against a head of 24 ft. (7.3 m.). Provision is made for 15 per cent speed regulation in

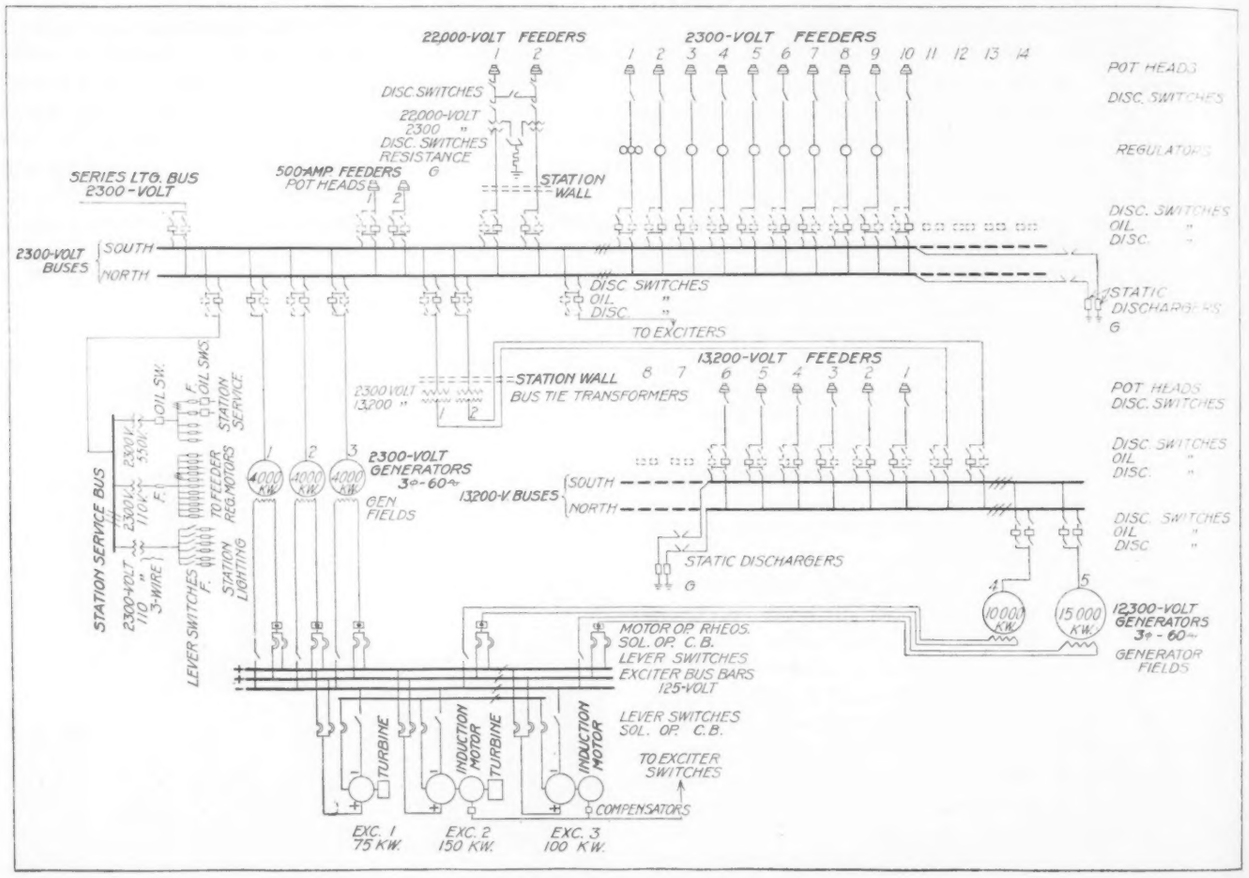


FIG. 2—LARGE GENERATORS ENERGIZE 13,200-VOLT BUS AND SMALLER GENERATORS FEED 2300-VOLT BUS, THE TWO BEING CONNECTED BY BUS-TIE TRANSFORMERS

Each main generating set is equipped with the following instruments: Hohmann & Maurer mercury column vacuum gage, Ashcroft steam-pressure indicator and vacuum indicator, first-stage steam-pressure indicator and a General Electric speed indicator reading in terms of frequency. A 110-volt lamp-signal system is in use at the various units and is connected with the switchboard.

Generating Units

All the generating units are General Electric three-phase alternators driven by Curtis horizontal turbines. The three 4000-kw. units are wound for 2300 volts, the larger generators for 13,200 volts. There are two General Electric-Terry exciters of the combination motor and turbine-driven type, rated at 150 kw. and 200 kw.; one 100-kw. motor-driven exciter and one 75-kw. turbo-exciter, all wound for 125 volts. It is planned to stand-

ardize the use of combination exciters. A spray air-washer installation with a capacity of 50,000 cu. ft. (1400 cu. m.) of air per minute is installed to treat the ventilating air. Another set will be provided shortly.

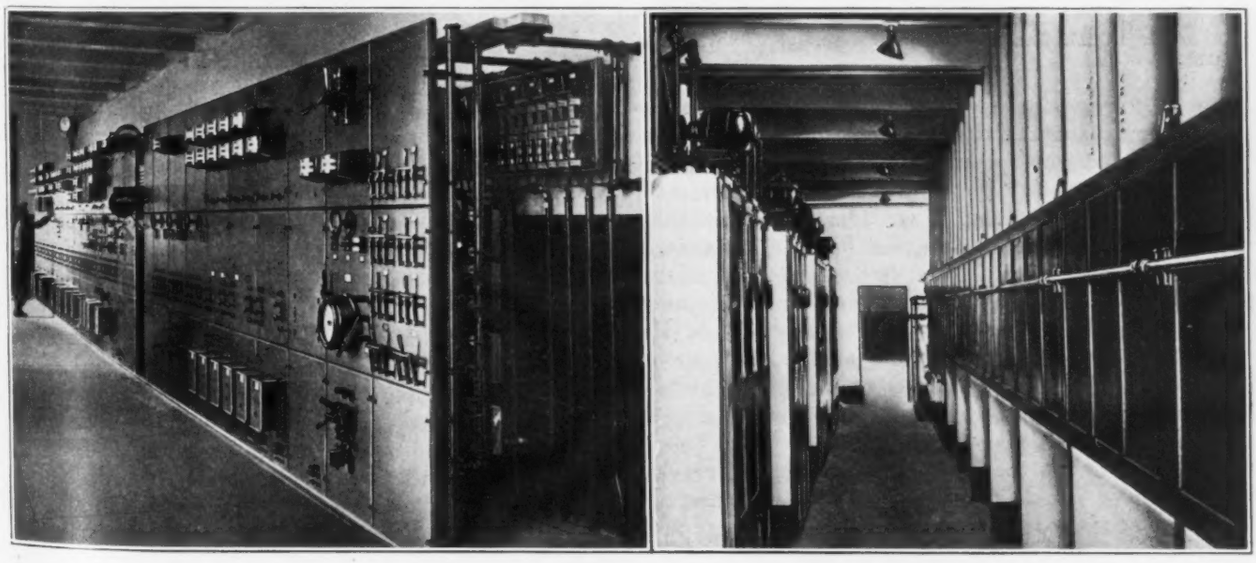
The turbine room is served by a 50-ton Northern four-motor electric crane which has a 5-ton auxiliary hoist. The bridge speed is 175 ft. (53.3 m.) per minute, the trolley travel 100 ft. (30.4 m.) per minute, the main hoisting speed 6 ft. (1.8 m.) per minute, and the auxiliary hoisting speed 30 ft. (9.1 m.) per minute. The crane serves all the larger auxiliaries in the turbine room. A standard-gage railroad track enters the room on the ground level to facilitate handling heavy machinery while another track entering the room on the south side permits moving transformers into the building when they have to be repaired or inspected.

The electrical bay of the station is four stories high, the operating switchboard being on the third floor and completely shut off from the turbine room by a fire wall. The general arrangement of electrical layout was shown in Fig. 1 of the first installment of this article. The electrical bay provides for more feeders, switches and other electrical apparatus than the hydro-electric plant of the Mississippi River Power Company at Keokuk, Iowa, where the installed capacity in generators is nearly three times that of the New Bedford installation now under contract. This is due to the difference in service requirements.

Special effort has been made in this plant to isolate each switch and bus section from others. Every oil switch is housed in a reinforced-concrete compartment of sufficient strength to localize the effects of an explosion in the switch to that particular cell. The street-lighting equipment is also isolated; voltage regulators on the commercial lighting feeders are separately located and confined, and the 2300-volt and 13,200-volt bus systems are entirely separated. Furthermore, each of these systems has duplicate buses which are separated from each other by vertical fire walls.

The exciter switchboard and field rheostats are installed on the south side of the station just above the street floor and under the offices of the chief engineer. Installation of this apparatus outside the switchboard room enabled short runs of cable to be used between the exciters and the exciter buses, and from the latter to the generator fields. On the second floor are the switches and buses of the 13,200-volt system. The third floor contains the main operating switchboard, street-lighting switchboard and rectifier sets and local testing apparatus, and the fourth floor is devoted to 2300-volt buses and oil switches. Feeder regulators are installed on the third floor, in fireproof compartments separated from the main switchboard. These are conveniently situated where they can be connected with the 2300-volt system, the cables being carried down the north wall of the electrical bay from the bus and oil switch compartments to the underground conduit system.

Investment in duplicate selector-type oil switches has been avoided for the time being by the use of cross-connecting leads between each oil switch installed for feeder service and the appropriate terminals of the disconnecting switches placed between the oil switch and the buses. The cells are installed in the switch structure so that ultimately each feeder switch can be connected by remote control with either bus. For the present, however, only one oil switch is provided per feeder, selection of buses being made by knife switches. No feeder can be connected to a bus when the oil switch is open, and each feeder can be isolated from both buses by opening the oil break switch. The same arrangement prevails in connection with the oil switches used between the bus-tie transformers and the 2300-volt and 13,200-volt buses. The bus-tie transformers, of which there are six, are 1500-kva. General Electric oil-cooled transformers supported on rollers outside the station, as illustrated. The bus structure is supported on steel framework, the cables being carried thereto from the corresponding buses in the electrical bay through ducts and vertical concrete structures shown in the illustration. The latter are to prevent persons coming in contact with the high-tension cables where they rise to the outdoor bus structure.



FIGS. 3 AND 4—MAIN SWITCHBOARD AND VIEW OF OIL-SWITCH AND BUSBAR COMPARTMENTS

The 22,000-volt line radiating from the station is fed through six 750-kw. General Electric oil-cooled transformers installed in the same row as the bus-tie sets. They are connected with the 2300-volt busbars

on the low-tension side. This line is operated, Y-connected, with the neutral grounded through a resistance installed in a fireproof house at the end of the transformer banks.

The main switchboard, containing twenty-seven panels, is provided with remote-control connections to all oil switches, control energy being supplied by a sixty-cell battery furnished by the Electric Storage Battery Company. General Electric type H-3 motor-operated oil switches are installed in connection with both 2300-volt and 13,200-volt buses. The disconnecting switches are arranged for locking in position. All generating units, bus-tie lines, feeders, exciters and transformers for outside service are controlled from the main board. Dummy buses are not installed, they being considered unnecessary with this arrangement of panels and controls. The central location of the main board resulted in a saving of considerable control wire, with switch structures above and below. The control battery is charged by a 5-kw. General Electric motor-generator set in the switchboard room. From this room 22,000-volt open-air switches on the line side of the transformers, serving Lakeville and the territory at the east of New Bedford, may be opened by mechanical handling of rods and levers carried down the side of the building to the transformer bus structure.

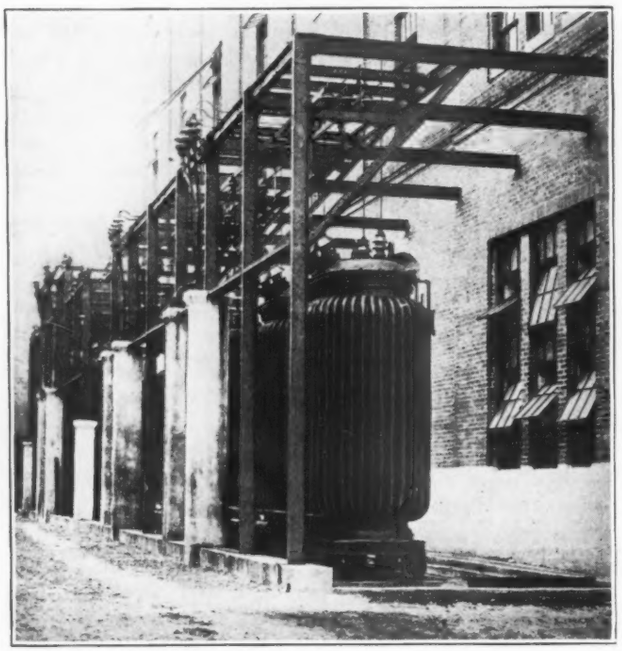


FIG. 5—BUS-TIE TRANSFORMERS WHICH ARE CONNECTED WITH BUSBARS INSIDE STATION BY CABLES LEADING DOWN CONCRETE DUCTS

W. H. Snow is manager, D. W. Beaman general superintendent, and R. H. Barber chief engineer of the New Bedford company.

Win-the-War Spirit in Business Letters

"See that a win-the-war spirit gets into your business letters" is the slogan of a movement launched by the Department of Commerce to remind business men that the every-day business letter is a most effective instrument for creating confidence in the government's war policies and inspiring others.

COLLECTING STATISTICS FROM CUSTOMERS' ACCOUNTS

Use of Tabulating Machines for Quickly Determining Vital Data Regarding Growth, Income, Rates, Etc.

BY G. R. KENNY
San Joaquin Light & Power Corporation, Fresno, Cal.

SINCE April, 1917, the San Joaquin Light & Power Corporation has used the Hollerith tabulating machine to compile statistics on accounts of light and power consumers. This company and the Midland Counties Public Service Corporation, with headquarters at Fresno, supply electric energy to consumers in five counties in central California. The population of the territory served is approximately 200,000. In November, 1917, the two companies were serving 26,657 lighting consumers and 3724 power consumers. The total connected load in power was 58,717 hp. Several large consumers who purchase power at wholesale rates for large industries, or for redistribution, are considered as power consumers, and the capacity of their transformers is included in the connected load above. The main transmission is at 60,000 volts and 30,000 volts, with distribution from thirty-one substations. During the year ended with November, 1917, 119,576,947 kw.-hr. were distributed from the substations.

Power consumers are served at uniform non-discriminatory rates, the principal types in use being the "block," "demand and energy" and the "Wright" forms of schedules. Flat rates per horsepower of demand are in use for irrigation pumping business. A straight kilowatt-hour rate is used for some of the oil-well pumping. Demand indicators are used to determine the demands in most cases. "Block" and "demand and energy" forms of rates are in use for lighting service.

Light and power consumers' accounts are kept in separate ledgers in each of the thirteen districts served. For the city and town service the consumers' ledger sheets are arranged in street-number order, the name being changed in case one consumer moves out and another moves in. In case a consumer moves out and it is probable that another will move in within a reasonable time, the meter is sealed and left on the premises. The ledger sheet is removed from the ledger where buildings are changed or the street-number order is otherwise upset. Each ledger sheet is arranged to carry a consumer's account for a period of two years and also for recording meter data and other necessary information.

One Hollerith sorting machine and one five-bank tabulator are installed in the Fresno office, and a key punch is supplied to the consumers' department in each district. The cards are punched by the consumers' department after the first of each month with the data for the previous month. One person can punch from 800 to 1200 cars per day. This work is done by regular employees in the consumers' departments.

When the system was installed each ledger sheet in each district was "coded" with the code numbers applying to it. Any changes in code are made on the ledger sheets when the information which makes the change necessary is recorded on the sheets.

A code which gives the size and voltage of single-

phase and polyphase meters, and the constant in use, if any, is entered on the ledger sheet, and the number appearing on each sheet is punched in the meter data column of the card for that consumer. Nine hundred and ninety-nine combinations are possible in this code, but only about 300 are in use. The even numbers are used for regular installations, and the next odd number if a demand indicator is installed. As an example No. 2 indicates a 5-amp., 110-volt watt-hour meter, but if a demand indicator were installed No. 3 would be entered on the ledger sheet. To each account or ledger sheet a number is given, and the "service" is divided under light and power.

The principal codes provided outside of the meter data are the "occupied as," under which the business is divided into fifty-one classifications, as "residences," "drug stores," "saloons," "restaurants," "agricultural consumers," "oil production consumers," etc., and the "rate schedule code," under which each rate schedule is given a specific number. These code numbers are entered on the consumers' ledger sheet, and do not vary unless there is some change in the installation or the business.

A "new or old" code is provided to show present consumers, business disconnected during the month, and new business connected. The "minimum" code covers the several classes of minimums in use by the company, and is used only when a consumer is billed on a minimum. The maximum demand, consumption and amount of bill are entered each month on the ledger sheet, but the connected load is changed only when a change is made. The information regarding connected load in power is accurate, but it is very difficult to keep accurate record of the connected load of lighting consumers, owing to so many changes being made without the company being notified.

Methods of Collecting and Tabulating Information

When the system was put in operation all ledger sheets were "coded." The code number is changed if changes are necessary, and all new ledger sheets are "coded" when placed in the ledger. The key-punch operator punches the month, year and service automatically, and finds the account number, district number, "occupied as," rate schedule and meter data codes, and connected load on the upper part of the ledger sheet. The maximum demand, consumption, amount of bill, and the new or old minimum codings, are taken from the monthly entry in the ledger. One card is punched for each sheet, a special "new or old" code number being provided for dead sheets. The codes are then checked and sent to the general office. The total earnings are taken directly from the ledgers, proved, and reported in totals in advance of the cards being punched. As soon as the cards arrive at the general office they are run through the tabulating machine and the total earnings taken. This must agree with the earnings already reported. If not, the adding machine tapes are sent in and the cards checked against them. If the earnings in dollars and cents agree it is assumed that all other data contained on the cards are correct. The cards are then run through the sorter to eliminate dead accounts, company business, cut-outs and adjustments. The remaining cards represent active consumers for the month. The eliminated cards are tabulated for all information contained on them. The active cards are run through the sorter and segregated according to rate schedules, then put through the tabulator, which counts the cards and sums up the connected load, maximum demand, consumption and amount of bill. This information is recorded by rate schedule and by districts by the operator and sent to the statistical department, where the information is entered in special books provided for that purpose, and statements showing the monthly system totals are made up. This information is entered so that annual totals can be taken by adding across the sheets. In the same manner the "occupied as," meter data, and new or old reports, are then made.

Statements of number of consumers, consumption, connected load, maximum demands, earnings and average earnings per consumer, per kilowatt hour and per horsepower, for power, are prepared by rate schedules and by classification of business under the "occupied as" code each month. A statement of earnings by districts, and the number of light and power consumers added or lost by districts, is prepared and a "meter report" made up.

Use of Information

The information is used to show the income from various classes of business, in studying the past growth of the business and estimating future growth and requirements, in determining which classes of business are most profitable, in studying the effect of rates, and in making new rates and changing existing schedules. As an example of the use in "rate making," the income from a given block rate may be accurately predetermined if the consumption in each block is known. This information can be quickly assembled by sorting the cards according to consumption and tabulating by kilowatt-hours used, either by all the amounts used, from zero to the maximum, or by the blocks which are to be applied. Before this system was installed it became necessary to assemble this information, but it required three months for two men to tabulate the information for 3000 consumers over a period of twelve months. A sample run indicates that this information can now be assembled for a twelve-month period on 26,000 lighting consumers in about six days.

About forty days' total time is necessary to punch and check all cards. One person operates the machines and one tabulates the information and makes the regular statements for 30,000 consumers. Ordinarily, but two or three days' time is required to punch and check the cards in each district, nine days being necessary for the largest district with over 10,000 cards. At the present time it takes about twenty-five days' time for the Hollerith machine operator to run the cards, and twenty days' time for a clerk to assemble the information and make the statements each month. The monthly reports are all prepared and out by the end of the following month. The work has been slow on account of many changes and lack of help in the districts. Under normal conditions the districts would be able to punch their cards, and the information could be tabulated and each month's statements made and out by the 20th of the following month. It is the intention to extend this scheme to give similar information for about 7000 gas consumers and 9000 water consumers. All of this work can be handled by the present machine and the present force.

STATION & OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

WOOD SHAVINGS USED FOR FUEL IN A POWER PLANT

Plant Shutdown Averted by Their Use During Coal Shortage—Description of Conveyor Utilized for Handling Shavings

The Missouri Public Utilities Company of Poplar Bluff, Mo., is using wood shavings from a nearby wagon-spoke factory for fuel. As the factory is about 2000 ft. (609 m.) from the power house, it was at first considered advisable to convey the shavings to the plant by means of a pipe line equipped with blowers. It was found impossible to do this on account of the character of the shavings, which were of the long hard wood type. The shavings therefore have to be hauled to the plant by wagons and are dumped into a storage shed. A flight conveyor carries the shavings to the boiler room and drops them into conveyor pipes which lead to the furnaces. Shavings swept past the pipe openings are caught by a chute and dropped into a cage mounted on a wheelbarrow. They are then wheeled back to the storage shed at frequent intervals.

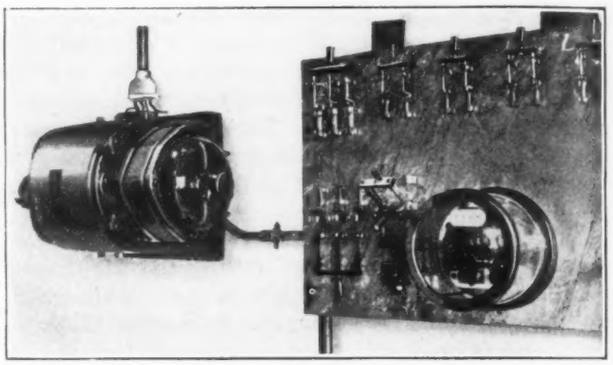
In order to fire the shavings in combination with coal the furnaces, which formerly burned coal alone, had to be redesigned. It was decided to extend the furnace fronts to give a Dutch oven effect. When the furnace fronts were extended it was possible for the conveyor tubes to drop the shavings directly over the middle of the fires. It has been observed that the efficiency with shavings is greater than that with coal alone because coal cannot be thrown far enough back into the furnace to give the best results. Under the present method of operation, coal is shoveled into the furnace in conjunction with the shavings, as the supply of shavings varies with the output of the wagon-spoke factory. During the recent severe winter it was impossible to obtain coal, and had it not been for the availability of the shavings the plant would have been compelled to shut down for lack of fuel.

Liberty Calls—Lend to Protect It

MOUNTING MOTOR-GENERATOR SET ON THE STATION WALL

Simple Arrangement Afforded and Less Space Occupied by This Unusual Installation of Battery-Charging Outfit

In a New England hydroelectric plant space limitations made it desirable to mount a small motor generator set, used for storage battery charging, off the floor and at low initial cost. Accordingly the machine was attached to the station wall, as illustrated, on a vertical base bolted through to the outside of the building. With all wiring carried in conduit and the controlling switch, relay and watt hour meter for this service mounted on a marble panel about 3 ft. (0.9 m.) from the motor-generator, an unusually simple arrangement, free from danger of injury to circuits, carried well above the flood line of the stream and affording a clear floor for station cleaning, is obtained. The front



PUTTING MOTOR-GENERATOR SET OUT OF MOPPING ZONE

of the unit does not extend beyond the clearance plane of the switchboard equipment on the front of the panel, and thus the set forms no material obstruction to movement in the operating room.

Your Money Helps to Save Liberty

FIVE-WIRE SUPPLY FOR BIG ELECTRIC FURNACES

Distribution of Heat in Large Furnaces Can Be Effected by Making Use of Four Electrodes and a Neutral

In a paper entitled "Electric Steel-Refining Furnaces" presented before the Faraday Society recently J. Bibby said that while two electrodes may be sufficient for small furnaces up to 5 tons capacity, it is not advisable to concentrate the heating zone in larger furnaces in two places. Another reason why more than two electrodes are required in large furnaces is because the electrodes at present available cannot carry more than 10,000 amp. each.

Whatever system is adopted it must be such that when equal currents are flowing through each of the arcs, then equal currents must be taken from each of three high-tension mains, and each of these three primary currents must be practically in phase with its voltage in order to secure a high power factor. Further, for metallurgical reasons it is considered desirable that a certain amount of current should flow vertically through the hearth to a fifth fixed electrode beneath it. Therefore some system is required which will impress an equal voltage between each upper electrode and the hearth electrode and give four equal heating zones.

The condition is met if four equal phases can be obtained on the furnace side of the transformers—one for each electrode and a common return to a neutral electrode beneath the hearth. In short, a four-phase, five-wire system is required. This can be obtained by having two sets of two phases working in parallel, but this system has serious electrical objections. The problem has been satisfactorily solved by using a four-phase arrangement, which involves three single-phase transformers. Two of the transformers have their terminals connected separately to the four upper electrodes. A tap is taken from the middle of the third or teaser transformer to the hearth electrode, and the terminals of the teaser transformer are connected to an intermediate tap on the main transformers. A closed system is thus obtained when arcs are struck between the four upper electrodes and the bath of metal.

This system gives equal voltages in the arcs and therefore equal heating zones. When the electrodes are regulated for equal currents equal currents are taken from the three primary mains. The average power factor of the system on a non-inductive load is unity. Further advantages of the system are that when the furnace is under poor regulation the primary current remains tolerably balanced with a high power factor.

First, Second, Third Call—Liberty

MILL REFUSE AND POWDERED COAL FOR POWER GENERATION

Comparative Values of Coal, Oil and Mill Refuse, with Estimates of the Cost of Using Mill Refuse and Powdered Coal

"If the war continues it will probably be only a matter of time before fuel oil will not be available for power purposes where other fuel may be substituted," wrote J. D. Ross, superintendent of lighting of the Seattle Municipal Company recently. "The federal Fuel Administration is already inquiring into the possibilities of a change in fuel for our steam plant. A supply of coal suitable for use on stokers does not appear to be available at a price that can be considered for power purposes. The fuel problem, therefore, narrows down to the use of powdered coal, which makes it possible to use lower-grade coals. Mill refuse is at present largely an economic waste, and its use would therefore be considered as especially serving the national cause at this time."

Several alternatives present themselves: (1) To buy powdered coal; (2) to buy screenings and have the city pulverize them; (3) to buy mill refuse. Since the engineering problems in any case can be solved, the best procedure is determined largely by the cost of fuel delivered to the furnaces. This makes each fuel directly comparable with oil as now used.

Based on efficiencies obtainable in commercial practice (70 per cent) under fair average load condition, the following comparison of heating values can be made for the different fuel mentioned:

Fuel	Heat Convertible into Steam (B.t.u.)
1 unit of mill refuse	8,730,000
1 bbl. oil	4,351,200
1 ton coal (10,500 B.t.u.)	14,700,000
1 ton coal (12,000 B.t.u.)	18,800,000

Therefore the equivalent prices delivered to the furnaces will be in the following ratios: 1 bbl. oil : 1 unit mill refuse : 1 ton coal (10,500) : 1 ton coal (12,000) as 1 : 2 : 3.36 : 3.86.

Based on the above commercial efficiencies and allowing 20 lb. (9 kg.) of steam per kilowatt-hour, the following comparison can be made:

Fuel	Electrical Equivalent (Kw.hr.)
1 bbl. oil	225
1 unit mill refuse	450
1 ton powdered coal (10,500)	756
1 ton powdered coal (12,000)	870

The overhead charges on the equipment necessary for the use of various fuel have a marked influence on the economy of any fuel, especially when used for an auxiliary or standby plant. Their effect is less marked when the fuel is used for a strictly generating plant. The low overhead for oil equipment makes this fuel very desirable for an auxiliary plant, but the high prices now prevailing make it prohibitive for generating purposes. The high overhead for powdered coal equipment makes this fuel unsuited for small plants or for large plants having a small station factor. The comparatively lower investment for mill refuse than for powdered coal operates in favor of mill refuse for the lower loads, provided always that there is an ample, dependable supply of fuel.

COST OF USING MILL REFUSE

Estimate of extra equipment necessary when using mill refuse*:

Barges (eight), at $6,000	$48,000
Receiving dock	20,000
Conveying machinery	5,000
Storage bins, chutes, etc., in building	10,000
Remodeling eight furnaces	25,000
Incidentals	12,000
Total	$120,000

Estimated total cost per unit of fuel	$1.89
Fuel cost per kilowatt-hour ($1.89 ÷ 450)	0.0042

COST OF USING POWDERED COAL

Estimated cost of powdered-coal equipment for 20,000-kw. plant $200,000

Estimated cost per ton of passing coal through pulverizing plant, based on interest at 6 per cent, writing off investment in ten years and different continuous load:

Kw.		Kw.	
20,000	$0.40	7,500	$0.87
17,500	0.445	6,000	1.06
15,000	0.50	5,000	1.25
12,500	0.63	4,000	1.50
10,000	0.69	3,000	2.00

In the Seattle steam plant the output for 1917 was 12,000,000 kw.-hr., while in 1918 it was 24,000,000 kw.-hr. This output represents less than 3000 kw. continuous load; hence the cost for pulverizing would run high. For such a load 110,000 bbl. oil, 32,800 tons of coal (10,000 B.t.u.) or 55,000 units of mill refuse (8,730,000 effective B.t.u.) would be required.

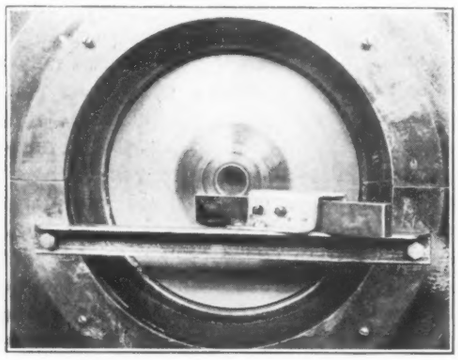
In view of the present fuel situation and as a result of the analysis he has made of the economy of different fuels, Mr. Ross has recommended that bids be called to determine the price of the following in amounts of 45,000 and 75,000 units per year: Mill refuse f.o.b. mill and steam plant; screenings f.o.b. steam plant and mine.

*Includes f.o.b. mill, towing round trip, interest at 6 per cent, depreciation (writing off investment three and a half years), extra labor above oil ($6,000).

LEAKAGE CURRENT CAUSED PITTING OF BEARINGS

Trouble Is Remedied by Attaching Brush to Bearing at End of Shaft to Provide Short Path to Ground

Owing to the presence of grounds and also because of weak insulation of some of the armature coils electrical leakage occurred on some of the motor-generators used in a generating plant serving a railway system. The leakage current transversed a path along the shaft



BRUSH FOR COLLECTING LEAKAGE CURRENT FROM GENERATING SHAFT

and through the bearings, causing pitting or disintegration of the journal surfaces. As a remedy there was assembled and affixed to the end bearing a ¾-in. by 1¼-in. (19-mm. by 31.7-mm.) copper brush which afforded a low-resistance connection between the shaft and ground. It was made adjustable so as to provide for wear. After three years of use no pitting has developed.

Principal Safe, Interest Sure

INSTALLING APPARATUS TO PROTECT DAM FROM HEAVY ICE

Utilization of a 5-Hp. Air Compressor Prevents Ice Formation During Winter Months, Releasing Five or Six Men for Other Work

Some hydroelectric companies operating in a cold climate have found it advisable to cut ice away from spillways and Tainter gates during the winter because the expansion and contraction of the ice causes dangerous pressures on the dams. Others believe that the condition brought about by the rise and fall of the water level causes more danger.

One company with several dams in the Northwest looks upon the cost of keeping its spillways clear of ice as an investment to insure against breakdown. Ordinarily it requires the work of six or seven men to keep a 2-ft. (0.6-m.) space clear along one of this company's 750-ft. (228-m.) spillways. It is difficult to obtain men to do this work in severe weather, however, owing to the exposure they must undergo. To obviate this difficulty the company last winter rigged up an "agitating" apparatus to prevent the water freezing so quickly. The apparatus consisted of a 5-hp. motor driving an air compressor delivering air to a pipe laid about 2 ft. (9.6 m.) under the water, parallel to and just back of the spillway. At intervals of 18 in. (45 cm.) this pipe was punctured with needle holes through which the compressed air escaped into the water. The pipe was supported by brackets placed on the spillway and on the ice that was left intact. After the ice had once been cut clear of the spillway so as to permit this pipe to be installed it was easier to maintain the 2 ft. (0.6 m.) of open water. One man and the 5-hp. motor were all that was necessary under ordinary weather conditions. When the thermometer registered exceptionally low additional men were added to the force. The scheme resulted in minimizing the expense and remedied the labor problem.

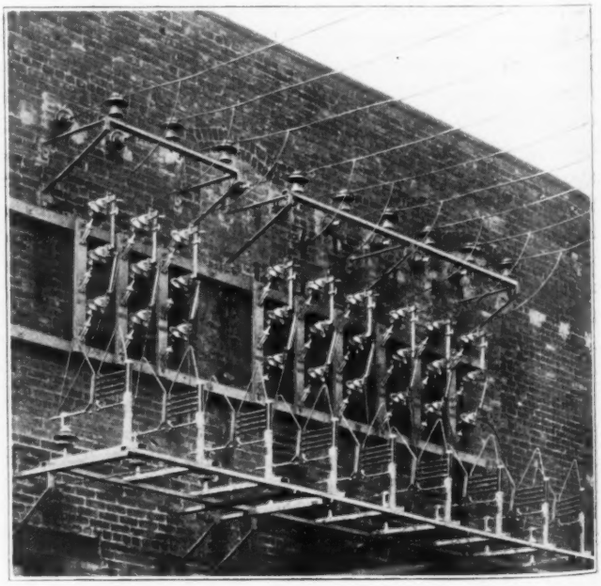
Make the Total Large—Lend Now

MOUNTING THAT MAKES ARRESTERS CONVENIENT

Support of Protective Apparatus on Steel Structure Attached to Building Wall Proves Excellent Method

Because of lack of space inside one of its 12,000/2300-volt substations the Sanitary District of Chicago employed the arrangement illustrated herewith to support its protective apparatus and the incoming lines. This construction was considered preferable to some other alternatives because more steel would have been required if a roof structure had been employed, while at least two poles would have been necessary if a separate outdoor structure had been erected. This location of the apparatus is also attractive because it is accessible from a roof just below and still does not present a hazard to life.

The apparatus consists of Schweitzer-Conrad high-



PROTECTIVE APPARATUS READILY ACCESSIBLE FROM ROOF BELOW

speed sphere-gap graded-resistance lightning arresters protecting three 12,000-volt, three-phase circuits. Each phase is equipped with a disconnecting switch and limit fuse, and the disconnecting switches are so connected that the arresters can be readily isolated for inspection and adjustment.

CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

USING CAMOUFLAGE IN HOUSE-WIRING CAMPAIGN

Company Advertises House-Wiring with Expectation of Accomplishing Many Things in Addition to Securing New Residential Contracts

A large central-station company in the Middle West is busily engaged in conducting a strong house-wiring advertising campaign. "How do you figure you can afford to make a bid for residential business now?" the sales manager was asked. He replied: "We have a great many prospective customers that we could reach by simply running a service. That would cost us only about $6 per customer on the average, and we can afford to take on that class of business. The business of that sort which we will get will be the direct result of our campaign of advertising and intensive solicitation. In addition we will receive some indirect benefits. In the first place, there are about 4000 houses in this city that are wired but not connected. Some of them can be 'hooked up' in a campaign of this kind. Besides this, the curtailment of lighting in signs, street lighting, in windows and in houses has cut down the company's annual revenue at a rate that would amount to $150,000 a year. If the company comes out as it now is and asks for new customers, the public and the municipality will soon begin to appreciate that the patriotic necessity for curtailment is apparently not so great as they imagined. So the house-wiring campaign may bring back to normal consumption some of the company's good sign and window lighting customers. Since the business of this class is largely the company's net, it is important that it be enticed back to normal as soon as possible."

Liberty Is in Peril—Will You Lend?

FINANCING NEW TIE LINES DESPITE WAR-TIME DEMANDS

Method That Is Meeting with Approval of Both Small and Large Companies in the Northwest When Coal Costs Are High

Under present conditions, with coal at a high level of prices and with winter-time deliveries of fuel very uncertain, many a company operating a small steam plant naturally feels that it would like to tie in with a neighboring large transmission company if possible. By so doing it not only shifts the generating responsibility to another company which may have some water power, but it also may reduce somewhat its production cost and put off into the far future any possibility of expenditures for plant replacements. From the small plant's viewpoint interconnection at the present time has many advantages.

When the tentative proposal to the transmission company is made, however, the difficulty of financing the tie line between the present transmission system and the small steam plant looms large. The large company is having trouble taking care of the financing of necessary war business and its own community. The transmission company would be glad to furnish the service at 2.5 cents to 3 cents per kilowatt-hour, however, if the financial difficulty were not in the way.

In the Northwest a number of companies are getting around their troubles in a common-sense sort of way. The small company with the steam plant is financing the line and in turn is selling it to the transmission company, taking in payment the stock of the transmission company. This plan works well for several reasons. First, the small company can easily raise the money for the line in its own little community because its present security holders and the other investors in its town are in businesses that are not greatly affected by war. They are accustomed to putting their income in banks or putting it back into their local business and are willing to divert it to a local utility enterprise at a fair price. So the small company can raise the money. Second, it appears a good stroke of business to take the large company's stock in payment for the line because they get it at a price to yield around 8 per cent and are likely to come out handsomely or any advance in market value. This method is satisfactory to the large company particularly because it relieves it from the financial strain. It is usual practice for the small company to draw the specifications for the line it expects to build and then submit them to the engineers of the larger company for such revision as may be thought necessary to make them conform fairly well with the transmission company's standards of construction. The small company then does the actual building of the line. This has been found wise under present circumstances, for the small company can usually build the line at a great deal lower cost than the transmission company. At first it may seem paradoxical that the small company with less experience can build cheaper than a large concern with transmission specialists. It is true nevertheless. The difference in cost comes largely in the labor-camp and transportation expense. The small company can pick up labor in its own easy market and usually makes no special provision for housing and feeding the men. They know the community and shift for themselves. Farmers with teams do the hauling during lulls in farm work, and this keeps down transportation expense.

This plan of providing service has, therefore, many advantages to both companies. It is being used to the mutual advantage of concerns in the Middle West and Northwest and is at the same time making for increased capacity in the small towns and for conservation of the nation's fuel.

Safest on Earth—Liberty Bonds

A NEW "THRIFT CARD"

Specially Designed for Use by New Jersey Company at Cooking Demonstration

The card here illustrated was prepared for the Public Service Electric Company, Newark, N. J., by S. H. Alexander, who is in charge of displays at the company's various offices, and was used in connection with a cooking demonstration which was given at one of the offices.

Public Service Gas Company
Public Service Electric Company
thrift
If you know a way
to save time -
If you know a way
to save labor -
If you know a way
to save fuel -
then you know how to
help your government.
Knowing how is not enough -
you must do it
S.H. Alexander

Our Boys Go—Shall Money Fail?

A DEPARTMENT TO LOOK AFTER THE TAX EXPENSE

Well-Organized Bureau Devoted to This Work Saves Central-Station Company Considerable Money by Its Endeavors

A Middle Western central-station company which has a department to look after all questions of taxation has found that this method of operation assists in preventing local taxing bodies from discriminating against it unjustly. This company's real estate and personal property taxes in recent years have increased from $220,000 to $240,000, but the ratio of its taxes to gross earnings decreased in the same period from 4.2 per cent to 3.9 per cent, relatively 7.1 per cent. The tax department of the company feels that this is a good record in view of the ratio of taxes to gross earnings shown by other companies in similar operating circumstances in the United States.

In making recommendations for continued activities of his department the taxation authority of this company recently said it did not appear reasonable to expect a decrease in valuation on the company's property in view of the rapid growth it was enjoying. He expressed the thought that the best policy would be to maintain cordial relations with all local taxing authorities and to try to keep valuations at their present level. He suggested that one way to effect a reduction in the amount of taxes paid would be to reduce the number of subsidiary companies and thus to eliminate the duplicate payment of tax under the federal law on income passing from one company to another.

DATA ON THE OPERATION OF ELECTRIC FURNACES

Electrical and Tonnage Ratings of Various Sizes of the Resistance Type—Some Types Pay for Themselves Quickly

Thaddeus Bailey, president of the Electric Furnace Company, in a paper presented before the Chicago Section, American Institute of Electrical Engineers, gave data on electric furnaces of the resistance type which should be of value to commercial men of central stations in discussing this class of business with industrial plant "prospects." The field of the resistance-type furnace is mainly in operations requiring temperature between 400 deg. and 1650 deg. Fahr. (200 deg. and 900 deg. C.) and includes such work as annealing and heat treatment of steel and other metals and melting of non-ferrous metals, especially those with a strong affinity for oxygen.

One furnace with a 20-in. by 12-ft. (50.8 cm. by 3.7 m.) hearth used for annealing brass and silverware blanks handles 1 ton (0.9 t.) of blanks per hour with an energy input of about 200 kw. A motor-driven pusher mechanism pushes a pair carrying the blanks into the furnaces and discharges another pair on the other side into a quenching bath at the end of each annealing period. Another furnace of the same general type, but with its pusher mechanism automatically controlled by clock-actuated relays, is handling steel motor-car parts. Its hearth is 26 in. (66 cm.) wide by 12.5 ft. (3.8 m.) long. It is heating 800 lb. (282 kg.) of steel to 1650 deg. Fahr. per hour with an electrical input of 130 kw. A third size of this general type has a hearth 4 ft. (1.2 m.) wide by 20 ft. (6.1 m.) long. It is heating 1.5 tons (1.4 t.) of steel to 1650 deg. Fahr. per hour with an electrical rating of 360 kw. The largest size of this type in operation has a hearth 7 ft. (2.1 m.) wide and 20 ft. (6.1 m.) long and handles 3 tons (2.7 t.) of steel to 1650 deg. Fahr. per hour. It is rated at 660 kw. Equipments of this character, when automatically controlled by a contact-making pyrometer, reduce the human element to a minimum and lessen the chance for error in treatment. One man loads the pans. Drawbar knuckles and motor-car parts are among the products now being treated in these furnaces.

Another and somewhat similar type of furnace is known as the car type. With this type parts loaded on cars are pushed into the furnaces, treated and pushed out. Cast-steel parts for motor-car construction, locomotives and car axles, aluminum, copper, brass and gun castings and forgings are treated in these car-type furnaces. Among the sizes of this type now in operation are those with hearths 4 ft. (1.2 m.) wide and 10 ft. (3 m.) long, with a capacity of 0.5 tons (0.45 t.) per hour and a rating of 150 kw., and those larger sizes with 6-ft. (1.8-m.) by 18-ft. (5.5-m.) hearths

with a capacity of 1 ton (0.9 t.) of steel per hour and a rating of 300 kw.

A new type of furnace that is just being put into operation for annealing steel and copper is the recuperative car type. It is arranged to accommodate two lines of cars passing through the furnace in opposite directions, so that the hot outgoing cars give up some of their heat to the cold cars on the way in. This furnace, which is 22 ft. (6.7 m.) wide and 19 ft. (5.8 m.) long, is rated at 600 kw. It will heat 150 tons (143 t.) of steel to 1500 deg. Fahr. or 350 tons (317 t.) of copper or brass to 1200 deg. Fahr. (649 deg. C.) in twenty-four hours. No covers are required to keep the metal from scaling.

Another new type of special furnace is one built for reduction of tungsten ores. It is also of the car type. The cars with their contents are, however, moved continuously through the heated furnace, which is gas-tight. After being fully heated the cars are pushed into a long discharge hood to cool slowly. The furnace is built in one size only. It is 10 ft. (3 m.) wide, 50 ft. (15.2 m.) long, and has a capacity equivalent to annealing 0.5 ton (0.45 t.) of steel to 1650 deg. Fahr. (900 deg. C.) in one hour. It is rated at 150 kw.

Melting furnaces of the resistance type were also discussed by Mr. Bailey as apparatus for melting brass, copper, zinc and aluminum. Tilting furnaces for this work with a hearth capacity of 1500 lb. (680 kg.) and a melting rate of 600 lb. (272 kg.) per hour are rated at 105 kw. The metal losses on furnaces of this type when handling yellow brass and pouring at 2200 deg. Fahr. are always less than 1.5 per cent. They are used in making extrusion press billets, castings for plumbers' supplies and slabs for cartridge case rolling. Operating records of these furnaces in actual use show that in melting brass the energy consumption averages for weekly runs from 540 kw.-hr. per ton to 515 kw.-hr. per ton. Non-tilting furnaces of the same general type with a hearth capacity of 7000 lb. (3175 kg.) of aluminum and a melting rate of 2000 lb. (907 kg.) of aluminum per hour are rated at 500 kw. The hearth measures 4 ft. (1.2 m.) wide and 10 ft. (3 m.) long. This same furnace used on brass or copper has a hearth capacity of 12,000 lb. (5443 kg.) and a melting rate of 4000 lb. (1814 kg.) of brass per hour.

These furnaces, Mr. Bailey stated, impart no particular quality to the metal treated because of their electric operation, but they are tools that for particular heating operations more closely approach the ideal equipment than any others in commercial use. In some cases these furnaces effect considerable saving over other methods. This is especially true where automatic heat treatment permits reduced labor cost and reduces the quantity of rejected products. In melting brass large savings are shown over crucible or open-flame furnaces, as electric furnaces permitting control of the furnace atmosphere reduce the zinc losses from 3 per cent to 4 per cent over the open-flame type and 2 per cent over the crucible type. Moreover, eliminating the crucible cost strikes out such a great item of expense that an electric furnace will often pay for itself in three or four months, where it replaces a crucible furnace even with energy at 2 cents a kilowatt-hour.

Will You Lend for Human Freedom?

USING BILL FORM WITH TWO DETACHABLE SLIPS

One for Cashier's Memorandum and the Other for the Collector—Latter Slip Is Used When Customer Mislays Bill

The Lehigh Valley Light & Power Company, Allentown, Pa., uses a bill form with two slips as illustrated, one a cashier's memorandum and the other a collector's memorandum. The latter is filled out at the same time the bills are made out in the billing department, all of which is done at one point. These collectors' slips are then detached from the bills before delivery and sent to the local offices where they are due. In this way a customer wishing to pay his bill but failing to bring the statement with him can very quickly be informed of the amount due. His payment can be accepted without telephoning or reference to other departments.

Immediately after the discount period these slips are returned to the bookkeeping department, where by removing those paid from the list there is left a complete record of delinquent customers, which is immediately turned over to the collector.

Allentown, Pa., Dec. 31, 1917

To **Lehigh Valley Light and Power Company,** Dr.

OFFICE: 542 HAMILTON STREET.

LIGHTING SERVICE From November To December

12-17

Present Reading
Previous Reading
Total Consumed
Rate per K. W.
Cts.

If paid on or before January fifteenth *Discount 10%*
Net
"READY TO SERVE" Charge
Flat Rate Net
Balance Overdue
SUNDRY ACCOUNT
(See terms on the Invoice)

Failure to receive bill cannot be accepted as a reason for allowing discount after the expiration of the discount period.

The Collector is NOT AUTHORIZED to make deduction or changes of any nature and has no authority except to collect.

Received Payment this 1918
LEHIGH VALLEY LIGHT AND POWER COMPANY
Per .....

OFFICE OPEN TO 9 P. M.—AVOID THE RUSH OF THE 15TH
Receipted Bill will not be returned unless requested

ALLENTOWN—1
CASHIER'S MEMORANDUM

Please keep bill but detach and send this stub with mailed remittance. RECEIPTED BILL WILL NOT BE RETURNED UNLESS REQUESTED.

12-17

Lighting Bill .....
Discount .....
.....
.....
.....
CASH .....
Sundry Sale .....
CASH .....

ALLENTOWN—1
COLLECTOR'S MEMORANDUM

To LEHIGH VALLEY LIGHT AND POWER COMPANY, Dr.

12-17

Lighting Bill, Net .....
(*No Discount allowable*)
Flat Rate .....
Overdue Balance .....
Sundry Account .....
CR. CASH .....
Remarks

BILL FORM USED BY PENNSYLVANIA COMPANY WHICH AIDS IN COLLECTIONS AND BOOKKEEPING

TECHNICAL THEORY & PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Magnetic Pull on Armatures of Electrical Machines.—E. ROSENBERG.—The maximum value of the one-sided pull is given by $F = C\pi DL(B/5000)^2(x/a_1)$, where πDL is the cylindrical surface of the armature and C has a value nearly equal to 2/3 except for two-pole machines with salient poles, in which cases C is about 0.4. B is the flux density at the point on the saturation curve for which the inclination of the curve is about five-sixths of that of the straight part of the curve.—*Science Abstracts, Section B*, Jan. 31, 1918 (abstracted from *Elektrotechnik und Maschinenbau*, Nov. 4 and 11, 1917).

Automatic Starting of Motors of Medium Rating.—PIERRE LEGRAND.—For direct-current motors, automatic starting is a relatively simple problem, solved by the use of either contactors or auxiliary starting motors. The principles underlying both these types of methods are described and their requirements outlined. With alternating-current motors it is necessary to have the contactor coils in circuit with the primary current of the stator and also to delay the action of the mechanism by a dash-pot, a method which, however, becomes ineffective with motors of 100 hp. and more. Compromises have been made by the use of an auxiliary dynamo. Some engineers prefer the auxiliary starting motor. These methods are also described by the author, who in conclusion dwells upon the large economy that can be realized by the employment of automatic starters.—*L'Industrie Electrique*, Jan. 25, 1918.

Generation, Transmission and Distribution

Transformer Losses in Large Rural Distribution Systems.—H. ROTH.—Two systems are compared. In the first the energy is transmitted and distributed at 20,000 volts or 30,000 volts. In the second the energy is transmitted to transformer stations at 30,000 volts to 50,000 volts and distributed at a lower pressure, say 6000 volts. Allowing for the extra copper losses in the intermediate transformers totaling 6000 kva., it is shown that when the distribution voltage is 20,000 the intermediate transformers increase the losses by about 20 per cent, but when the distribution pressure is only 6000 volts the losses are decreased by 4 per cent.—*Science Abstracts, Section B*, Jan. 31, 1918 (abstracted from *Elektrotechnische Zeitschrift*, Oct. 18, 1917).

Transmission-Line Practice; Sag and Span Problems.—LIEUT. E. T. DRIVER and E. V. PANNELL.—The authors give the fundamental formulas for determining sag and span and then point out how temperature, wind, sleet, etc., affect different kinds of conductors, including copper, aluminum, aluminum-steel and copper-clad steel. Tables and curves are given for calculating the sag on copper conductors when the ice and wind loading is relieved, increase in sag from 0 deg. to 120 deg. Fahr. with 600-ft. (182.8-m.) copper cables, and sag in feet and stress in pounds per square inch for different classes of cable on a 600-ft. span.—Toronto *Electrical News*, Feb. 1, 1918.

Electric Power Supply in Great Britain.—LEON GASTER.—In this article the author comments on the report recently issued by the coal conservation subcommittee of the reconstruction committee. In part he says that small generating stations are admittedly uneconomical. It is estimated that the adoption of the scheme recommended by the committee will result in an annual saving of about 57,000,000 tons of coal. This scheme is also commendable as it will increase the industrial output for a given coal consumption. The great advantage to the lamp industry of a standard voltage should also be borne in mind. In selecting the sites for the generating stations and in the choice of plant the possibility of working hand in hand with the gas supply companies should be carefully considered, as in this way the by-products of the coal can be utilized before it is used in the generation of electricity.—London *Illuminating Engineer*, December, 1917.

Ground Connections for Distribution Systems.—W. C. HESTON.—The great cost of ordinary grounding methods for overhead distributing systems has led a Portland company to experiment with various types of ground to see whether a more inexpensive method might not be found which would meet requirements. The results of these comprehensive tests and the conclusions drawn from them are presented in this article.—*Journal of Electricity*, March 1, 1918.

Control of Large Amounts of Power.—W. B. WETMORE.—The author considers in detail where reactance should be inserted so as to limit and confine disturbances on large networks. The subjects of limitation of disturbances, generator reactance, feeder reactance, voltage disturbance, busbar reactance, transfer of power, parallel operation and the limiting effect of fault resistance were also discussed.—London *Electrician*, March 8, 1918.

Installations, Systems and Appliances

Electric Purification of Gas.—J. SAGET.—A historic summary of the various processes used to eliminate solid or liquid particles contained in gas. Electrical apparatus which causes the ionization of these particles and expels them from the electric field created is described.—*Revue Générale de l'Electricité*, Feb. 9, 1918.

Constant-Torque Magnetic Clutch.—The action of a new magnetic clutch used in driving a dynamo for electric welding is explained. The clutch consists essentially of a differential electromagnetic coupling, which will release on overloads. The article is illustrated with diagrams of connections, construction details, efficiency curves, etc.—London *Electrician*, Jan. 25, 1918.

Labor-Aiding Appliances in Steel Works.—S. WELLMAN.—The subject of handling pig iron and scrap by the open-hearth charging machines and lifting magnets is discussed, it being stated that the saving in labor charges in American steel works by the use of these appliances amounts to nearly $100,000,000 per annum. Every open-hearth plant of any size in the world to-day is equipped with these auxiliaries, says the author, and they are considered as much a necessary part of the equipment as the furnace itself—London *Electrician*, March 8, 1918.

High-Temperature Processes and Products.—Electric furnaces are now being used by the thousands for the purpose of hardening dies and gages. In some instances these furnaces are also used for gear hardening. Another important product of the electric furnace is carborundum. There are more than seventy electrical furnaces in Sheffield, England, for refining steel, having an output of over 150,000 tons per annum.—London *Electrician*, March 1, 1918.

Electroculture at Chester, England.—An interesting report on electroculture experiments carried out during the summer has just been presented by S. E. Britton. The electrical equipment consisted of a 10-in. (25.4-cm.) induction coil with mercury-break current interrupter, Lodge valves and an earth plate. An elevated net of No. 30 galvanized-steel wires placed 15 ft. (4.57 m.) apart and hooked to 7/16-in. (1.6-cm.) span wires by insulators, was used for the one electrode, the whole being supported by six poles. To each of the poles was fixed a wrought-iron bar which enabled the discharge wires to be placed at any distance above the ground between 2 ft. 6 in. (76.2 cm.) and 6 ft. 6 in. (198.1 cm.). The apparatus was supplied with 5 amp. at 210 volts direct current to maintain a spark ¾ in. (1.9 cm.) long when an earth wire was placed that distance from any part of the discharge network. At the beginning the discharge wire was placed as near as possible to the ground, and, as the crop grew, raised to about 6 in. (15.2 cm.) above the foliage. This experiment indicated that it is not detrimental to place the discharge wire near to the plants, and it was concluded that electroculture increased potato crops as much as 153 per cent in some cases. Some kinds of potatoes thrived better than others under this treatment.—Toronto *Electrical News*, March 15, 1918.

Electrophysics and Magnetism

Magnetization of Iron in the Absence of Hysteresis.—WINTHROP R. WRIGHT.—In general two methods have been proposed for suppressing hysteresis, namely, mechanical shocks or vibrations and an alternating magnetic field, either transverse or longitudinal. While Ewing employed mechanical vibration, others used alternating-current fields superposed upon the magnetic field and yet others investigated the change of magnetization with the temperature. A table giving the composition of steels in per cent is included in the article.—*Physical Review*, March, 1918.

Electrochemistry and Batteries

Stellite as a Substitute for Platinum.—E. HAYNES.—Refers to the present scarcity of platinum and to possible substitutes. An alloy of gold and palladium is probably the best alternative material. While the cost is high, bulk for bulk, it is only half that of platinum. The alloys of nickel with chromium, silicon with iron and pure quartz have also given satisfactory results where resistance to acid attack is the requirement.—*Proceedings of the American Chemical Society.*

Units, Measurements and Instruments

Three Devices for Use in Electrometry.—E. H. KENNARD.—A method is suggested for increasing the deflections of an electrometer under circumstances where the scale cannot be conveniently placed a long distance from the mirror. The suggestion is that a concave lens be interposed between the mirror and scale to magnify the deflection. Sometimes a simple means of connecting two wires together is desired which will permit of easier disconnection than a soldered joint and yet will not introduce the additional capacity and possible leakage of a key. For this purpose a little silver cup may be soldered to one wire and the other wire attached to a piece of heavy wire tipped with a silver point and bent so that the point rests upon the floor of the cup. To obtain time signals at rather long intervals, a torsion pendulum is more useful than a gravity pendulum because of the ease with which the period may be varied over a wide range.—*Science*, March 15, 1918.

An Electrical Instrument for Recording Sea-Water Salinity.—ERNEST E. WEIBEL and ALBERT L. THURAS.—An apparatus to give a continued record of sea-water salinity by the measurement of its electrical conductivity is described. A pair of electrolytic cells has been designed which when used with a suitable alternating-current galvanometer will give satisfactory operation in connection with a recorder. The temperature compensation is obtained by immersing both cells connected in the two arms of a Wheatstone bridge in a bath of uniform temperature.—*Journal of the Washington Academy of Sciences*, March 19, 1918.

Power Plant Instruments as an Investment.—M. A. SALLER.—This article deals with the installation of automatic feed-water regulators, the author saying that they should be an excellent investment in practically every plant, except possibly in small plants running at a very steady load, where the feed pumps can be run at a steady rate just sufficient to supply the feed water as fast as it is being evaporated. Among the benefits which can be derived from their use are the following: (1) Elimination of the uncertainty attendant on hand regulation; (2) firemen or boiler-room force relieved of this care and attention; (3) provision of a continuous feed in accordance with load demands, making possible the maintenance of the highest attainable feed temperature; (4) maintenance of a steady water level which results in the production of drier steam; (5) improved firing and furnace conditions, and (6) reduction in wear and tear by eliminating expansion and contraction strains in the boiler. Wherever a variable or fluctuating load is encountered the automatic regulator can be arranged to adjust the feeding of the water to the particular load conditions.—*Power Plant Engineering*, Chicago, March 15, 1918.

Temperature Effects in Direct-Current Meters.—G. W. STUBBINGS.—The author points out that a temperature variation of 3 deg. C. will cause a variation in the accuracy of an unshunted mercury meter of about 1 per cent. When two such meters are being used, one at

20 deg. C. and the other at 8 deg. C., there will be 4 per cent difference in the accuracy of the two meters. Then follows a discussion of the magnitude of the temperature coefficient of various types of meters. In meters like the shunted watt-hour type the elimination of temperature effect should be more feasible than in the simpler types, owing to the greater number of available adjustments. The high temperature coefficient is a serious defect in the small mercury meter. There seems no simple way in which it can be decreased, and until the problem is solved the commutator meter will retain an advantage over the small mercury meter in that the temperature coefficient of the former meter can be made as small as may be desired.—London *Electrical Review*, March 1, 1918.

Telegraphy, Telephony and Signals

Stray Interference in Radio-Telephony.—Alfred N. Goldsmith.—With the more sensitive receivers—*e. g.*, the regenerative vacuum tube receivers—heavy "strays" have a more detrimental effect than merely to cause noises. They break up the incoming sustained wave trains of the receiving system and thus prevent the utilization of resonance phenomena in circuits having small damping ability. Some types of detectors—*e. g.*, the sensitive crystals or gas-containing bulbs—may be paralyzed by heavy strays and require some time to regain their sensitiveness. Even very high-vacuum tubes may show this effect, since a powerful stray impulse may charge the grid negatively to such an extent that the plate current will be practically cut off until the grid charge escapes by the normal leakage. In some tests over considerable distances it was found that good reception requires that the signal audibility shall be three times that of the strays and that the strays shall not occur continuously even then, but intermittently and not more frequently than say once or twice per second. Reception becomes difficult if the strays are five times as strong as the signal, and almost impossible if the ratio is greater, particularly if the strays are continuous. The effective range of a radiophone transmitter depends on the loudness of strays at the receiving station, and consequently any method of reducing strays should increase the effective power of the transmitter in just that proportion.—*Wireless Age*, March, 1918.

Wartime Wireless Instruction.—E. E. Bucher.—Ninth article of a practical course for radio operators. Among the subjects covered are coupled transmitter circuits in radiotelegraphy, wave length and frequency.—*Wireless Age*, January, 1918.

Signal Officers' Training Course.—Major J. Andrew White.—Eight articles in a series intended for instructing soldiers preparing for United States Army service. This article deals with the radio apparatus of the Signal Corps and describes the construction and operation of the equipment used. Among the subjects covered are the following: Sectional mast, antenna and counterpoise, generator, speed indicator, gearing, connections, operating chest, quenched-spark gap and tuning of sending set and receiving set. Some useful data are given in the accompanying tables.—*Wireless Age*, January, 1918.

Receiver for Undamped Oscillations.—By means of a combination of capacity and shunt resistance, it is possible to adjust the voltage of a plate battery to a value higher than would be possible without its use. A critical adjustment of the value is thus obtained, so that the effect of very minute disturbances impressed thereon causes a much greater flow of current through head telephones when receiving damped and undamped oscillations.—*Wireless Age*, March, 1918.

Figuring for the Power Plant.—P. A. Price.—The article gives data required for the determination of power plants for common-battery telephone exchanges and shows how these data are applied to practical cases to provide for future exchange growth.—*Telephony*, March 16, 1918.

Miscellaneous

Hydroelectric Power and University Instruction.—With the development of hydroelectric power in the Alpine and other regions of France, certain industries—*e. g.*, electrochemical, electrometallurgical, general mechanical engineering, paper-making, etc.—are also being developed. The Polytechnic Institute attached to the university intends to keep pace with the requirements that will grow for technically trained men for the electrical and allied industries. In an article in *La Nature* for Feb. 9 the director of the Polytechnic outlines the courses of instruction held at the institute. The establishment comprises (1) a high school of electrotechnics for training electrical engineers, electrochemists, electrometallurgists, etc.; (2) an elementary electrotechnical school; (3) an electrical standardizing and testing laboratory; (4) a school for the paper-making industry; (5) a paper-testing laboratory; (6) an electrochemical and electrometallurgical test station with a 1000-hp. experimental plant. A chair of electrochemistry and electrometallurgy has also been established at the university.—London *Electrical Review*, March 1, 1918.

The Fertilizer Industry and Its Power Requirements.—J. E. Mellett.—The power requirements of different types of plants are given, the different operations discussed, and the kilowatt-hour consumption and power cost per unit of product are presented for several plants engaged in this work.—*General Electric Review*, February, 1918.

Constant Heat for Metal Electrode Welding.—Robert E. Kinkead.—Believing that constant-arc temperature requires constant current, many persons believe that the latter condition is essential for welding. On the other hand, constant heat in an arc requires that the product of the current and voltage be constant. The author expresses the opinion that designers of electric welding apparatus have neglected the technical details that should have influenced them.—*Railway Electrical* Engineer, March, 1918.

Revision of Boiler Code.—The revisions of the boiler code made recently by the American Society of Mechanical Engineers are outlined.—*Journal of the American Society of Mechanical Engineers*, March, 1918.

Purchasing Coal by Specification and Methods of Sampling.—J. A. Moyer and J. P. Calderwood.—This article, embodying information of considerable value, deals with the purchasing, specifying, sampling and analysis of coal, the calorific value requirements, and methods of its determination. The specifications issued by several companies, corporations and engineering societies are quoted.—*Pennsylvania State College Engineering Experimental Station Report*, 1916.

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

MEMBERS OF A. I. E. E. IN UNIFORMED WAR-SERVICE

Total Number Up to April 1 Was 760, or More than 8 per Cent of the Aggregate Membership, Which Is 9200

F. L. Hutchinson, secretary American Institute of Electrical Engineers, states that the total number of members in the uniformed service, including those instances of which notice was received after the Year Book went to press and up to April 1, is 760. This is more than 8 per cent of the total membership, now in excess of 9200.

In the 1918 Institute Year Book the names of members who are in the army or navy of the United States or of an allied nation have been designated by a special entry in every case where notification to this effect had reached the secretary.

ILLUMINATING ENGINEERS TO HOLD A CONVENTION

Society Council Approves Tentative Report of Committee on Time and Place—One-Day Technical Session on War Lighting

A tentative report has been made to the council of the Illuminating Engineering Society by the committee on time and place for the annual convention.

The members of this committee, on which are representatives of each section, decided that the usual annual convention, including the entertainment features and excursions, was undesirable at this time. The consensus of opinion favored a short technical session.

The council approved the report and decided that a one-day technical session consisting of papers on lighting subjects pertaining to the war should be held. Details as to time and place were left in the hands of the committee, which will make such further recommendations to the council as seem advisable in the light of future conditions.

N. E. L. A. CONVENTION TO BE AT ATLANTIC CITY

June 13 and 14 Have Been Fixed as the Time for Annual Meeting at the Famous New Jersey Seashore Resort

The convention committee of the National Electric Light Association decided unanimously on April 3 to recommend to the officers of the association to hold the annual meeting, devoted entirely to war problems, at Atlantic City on June 13 and 14, with the Hotel Traymore as headquarters. President Lieb has decided accordingly.

While it is felt that it is necessary under the constitution to hold the annual meeting, the essential requirement is the limitation of work in the meeting to the consideration of pressing and vital war problems as related to the industry. In view of the fact, however, that practically all member companies are short-handed and that their officers have their time taken up not only with general problems of the industry but with local problems and difficulties that come upon them as patriotic citizens, it is believed that the attendance at the meeting will inevitably be much smaller and more restricted than would occur in normal times and under the usual conditions, all other subjects, however important, being swallowed up for the time being in the fundamentally vital and essential one of winning the war.

The convention committee is composed of Walter Neumuller, New York, chairman; T. C. Martin, New York, secretary; H. C. Abell, New York; J. L. Bailey, Baltimore; R. H. Ballard, Los Angeles; M. R. Bump, New York; J. E. Davidson, Omaha; Leavitt Edgar, Boston; E. A. Edkins, Chicago; Dudley Farrand, Newark; Martin Insull, Chicago; W. H. Johnson, Philadelphia; A. W. Leonard, Seattle; Robert Lindsay, Cleveland; S. J. Lisberger, San Francisco; R. J. McClelland, New York; E. S. Mansfield, Boston; C. S. Ruffner, St. Louis; Frank W. Smith, New York; S. B. Way, Milwaukee, and W. F. Wells, Brooklyn, N. Y.

HOTEL TRAYMORE, ATLANTIC CITY, WHERE N. E. L. A. WAR CONVENTION WILL BE HELD

Helping to Sell the Third Liberty Loan

Typical Example of the Part of Electrical Men Seen in Boston, Where a Great Parade Opened the Campaign—Central Station Employees and Others Swell the Totals

THROUGHOUT the country the different branches of the electrical industry are giving their earnest attention to the best ways and means of advertising and selling the third Liberty loan. Typical of their activities is the part taken in the great parade in Boston on Saturday, April 6.

Although it was 6.45 p. m. when the section of the Edison Electric Illuminating Company of Boston reached the reviewing stand it presented an imposing appearance. President C. L. Edgar marched at the head of his employees. Behind, in the first row, were General Superintendent W. H. Atkins and bureau chiefs; the Edison company service flag with 300 stars; the Edison girls' section; the Edison Red Cross float, with boat symbolizing carrying aid across the water to the front, and the men's contingent.

Edwin S. Webster led the Stone & Webster contingent in the same parade, and directly following him were Russell Robb and Henry G. Bradlee of the firm.

New England Central Stations and the Liberty Loans

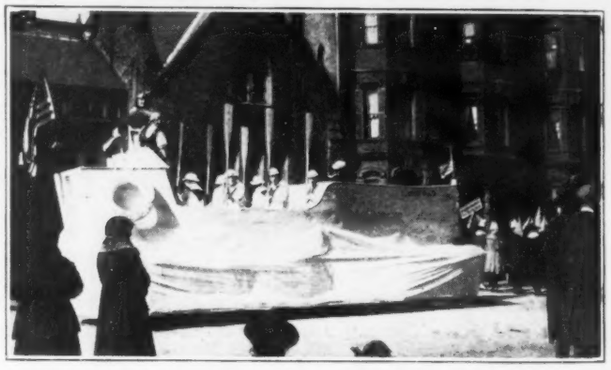
Every central station in New England with which the Electrical World has been in touch as the campaign for the third Liberty loan opens is in hearty sympathy with the raising of funds for the war work of the government. In general the companies do not purchase and carry the bonds for the employees, leaving that for the banks. The latter are usually so well organized to do this work that the central stations have not found it necessary or desirable to underwrite the loans on behalf of their own people, speaking generally.

The companies, however, are co-operating with the banks in every way and in many cases are deducting from salaries and wages, with the consent of employees, the installment payments required where the bonds are not purchased outright. In some cases companies purchase bonds on their own corporate accounts, but this is not a general practice in view of the present high cost of money.

Not many of the central stations in New England have issued publicity material of their own composition bearing upon the Liberty loans, but special plans for the sale of bonds have been carried out successfully, in addition to the routine banking methods. The central stations operated by C. D. Parker & Company of Boston, instead of making a Christmas gift of money to their employees last year, anticipated this in the cases of those purchasing fifty-dollar bonds on installments by crediting each purchaser at the beginning of the second loan drive in October with the first ten weekly payments, amounting to $10 per bond. This plan encouraged subscriptions and was much appreciated throughout the organization.

Employees of the Edison Electric Illuminating Company of Boston took $80,000 bonds on the first loan and $78,000 on the second, subscriptions being made through a local savings bank. *Edison Life*, the company's monthly publication for employees, supported the loans most vigorously in both editorial and reading pages. The company has about 2000 employees, and the general plan of installment payments from wages and salaries was followed, usually one man from each department looking after the deposits at the bank. On its own account the company purchased bonds of the second loan to the amount of $530,000. The treasurer of the company gave a number of talks to employees in groups on the earlier loans. The third loan is being handled through a committee headed by J. W. Cowles, superintendent of installations, and it is expected that the same general arrangement as in the first two will be followed.

The Narragansett Electric Lighting Company, Providence, R. I., purchased bonds and carried them for its employees in the first two loans and will do the same this time. The usual $1 per week payment basis per $50 bond was required. The company gave its employees all coupons. About 200 employees purchased bonds in the first two loans, aggregating $34,000. The employees of the Worcester (Mass.) Electric Light Company subscribed to bonds to the amount of $14,300 on the first two loans, $1 per week payments being made on the fifty-dollar basis. The company purchased bonds to the amount of $154,800 in its own name, but did not carry its employees' bonds. About 90 per cent of the employees subscribed.



FLOAT OF EDISON ELECTRIC ILLUMINATING COMPANY

At Hartford, Conn., the industrial and public utility subscriptions to the Liberty loans were handled in large measure through the Aetna Life Insurance Company, which worked out a most successful plan under the personal supervision of its president, former Governor and United States Senator Morgan G. Bulkeley. The Hartford Electric Light Company participated in this plan, under which twenty months is allowed for payment on the bond, an unusually liberal period. On the first loan the Aetna company allowed 3.5 per cent interest on the money paid in by the subscriber; on the second loan 4 per cent, and the third loan will be handled along the same lines but with 4.25 per cent interest allowance.

EDISON ELECTRIC ILLUMINATING COMPANY DIVISION IN BOSTON LIBERTY LOAN PARADE

STONE & WEBSTER DIVISION IN BOSTON LIBERTY LOAN PARADE

Business Men in Great Chicago Meeting

Government Organization in Relation to Business in War, the Railroads, Financing of War and Ships the Supreme Questions Before United States Chamber of Commerce

FOUR questions of supreme importance to the nation as a whole and to the American business world formed the nucleus around which the sixth annual convention of the Chamber of Commerce of the United States, held this week in Chicago, centered. These were government organization in relation to business in war, the railroads, the financing of war and ships. The definite, practical and concrete things that business can do not only to assure the future of this country, a speedy victory and a solution of the labor problems but also to keep intact the germ of existing but less essential industries so that they may blossom forth with renewed vigor after the war were discussed from all angles. Business men of the highest rank, Cabinet officers, bankers and economists contributed greatly to the importance of the convention and its deliberations. As an evidence of the universality and recognition of general business in the war may be cited the addresses of Secretaries Daniels and Lane and that of Earl Reading, the British Ambassador. Business could ask no greater recognition than the presence of these men at its sessions.

R. Goodwyn Rhett, president of the chamber, painted the vision of America in glowing color, reminding his hearers of their greater obligations to civilization and to country than to themselves. That the great development of this country and of its resources has been due in large part to the energy, enterprise and genius of the American business man was the idea developed. His was the leadership, the vision and the courage to follow that vision to realization. Linking this idea up with his conception of the mission of the United States Chamber of Commerce, Mr. Rhett said: "To me the highest mission of this chamber is to put a soul into business, to transform the cold clay into the sentient being, to transfuse into the marble statue the warm blood of the human being that will make its face to shine, its eyes to glow, its hands to clasp, its heart to beat and its soul to vision. In that sentient being only can democracy find its safeguard and protection. When business men have found out that what is not good for the country is not good for business and have transmitted that creed to their fellow citizens and made them understand that it should also be the creed of liberty, of agriculture, of the citizenship of America, they will have placed democracy on a broader foundation and have mounted infinitely higher in the scale of civilization."

Reports of the various committees were presented at the Tuesday afternoon session and on Wednesday morning. On Wednesday afternoon the following reports were made: Finance, Charles S. Hamlin, Federal Reserve Board; railroads, Harry A. Wheeler, chairman National Chamber's committee on railroads. The chamber's activities in relation to government organization, shipping and finance were presented in brief addresses by Waddill Catchings, chairman war committee; Edward A. Filene, chairman war shipping committee, and Wallace D. Simmons, chairman committee on finance.

On Wednesday evening the Auditorium theater was filled to capacity—for the convention was the largest ever held by the chamber—to listen to addresses by Josephus Daniels, Secretary of the Navy, and Franklin K. Lane, Secretary of the Interior.

Secretary Daniels devoted the major portion of his speech to a recital of the achievements of the American navy in convoying troops to France and in patrolling the seas in conjunction with the fleets of the Allies. He accentuated the fact that ships are vitally necessary in winning the war and urged the business men of the country to give up skilled mechanics so that the shipbuilding program can be carried through without delay.

Secretary Lane, in the midst of a very patriotic speech, outlined a scheme for caring for the returning armies of the United States when the war is over. Secretary Lane said: "We must think of the making of a new America, and we must begin with the boys who come back from the front. I say that every one of these men should have an opportunity to acquire a piece of the soil of the United States. We have along the lines of the Colorado River a million acres which can be irrigated if we will dam that river and develop power and hoist that water on to the mesa. It will take vast numbers of men from the returning army to build these dams and put up that power plant. I would pay those boys in farms on the mesa itself. Let each man have his forty acres of irrigated land with a house, with stock, and let him pay Uncle Sam in labor for it by constructing the works which make it possible."

There were indications in Chicago during the convention that this proposal of Secretary Lane might come forward in the form of bills in Congress before long.

Thursday's Four Sessions

Four sessions were held simultaneously on Thursday, one devoted to government organization in relation to business in war, the second devoted to finance, the third to railroads and highway transportation, and the fourth to shipping.

Waddill Catchings, chairman of the war service executive committee of the Chamber of Commerce, presided and addressed the meeting on the war-time organization of industry. The discussion that followed embraced these topics: (a) What principles should be adopted by the government as the basis of price control? (b) To what extent should the government fix prices? (c) What regulations should govern the determining of priorities? (d) What is a non-essential industry under war conditions? "How shall employer and employee co-operate to maintain war-time production?" was discussed by Prof. Leon C. Marshall of the University of Chicago, until recently secretary of the advisory committee of labor administration, Department of Labor. William H. Vandervort, a member of the official conference board of employers and employees,

also spoke. "Reconstruction in Foreign Trade" was the subject of an address by Dr. Frank W. Taussig, chairman United States Tariff Board. James G. White of New York City was another speaker.

Charles A. Hinsch, president American Bankers' Association, presided at the session on finance. "Trade Acceptances" were discussed by Lewis E. Pierson, chairman of the board of directors of the Irving National Bank, New York; George Woodruff, president First National Bank, Joliet, Ill.; W. B. Fish, treasurer Printz Biederman Company, Cleveland, Ohio; Wallace D. Simmons, president Simmons Hardware Company, and George H. Paine of Philadelphia. "The Effect of Government Financing on Industries" was dealt with by David R. Forgan, president National City Bank, Chicago; Thomas N. McCarter, president of the Public Service Corporation of New Jersey, Newark, N. J., an abstract of whose address is given below; August H. Vogel, secretary and treasurer Pfister & Vogel Leather Company, Milwaukee, Wis.; John V. Farwell, president John V. Farwell Company, Chicago, and O. M. W. Sprague, professor of economics at Harvard University. "How May Helping the Shipbuilders Best Be Made the Business of Local Organizations?" was the subject of addresses by Charles E. Falconer, chairman of the war shipping committee, Baltimore; Edgar S. McKaig, secretary of the war shipping committee, Philadelphia, and Crawford H. Ellis, chairman of the shipbuilding committee of the Louisiana State Council of Defense.

Harry A. Wheeler, chairman of the chamber's committee on railroads, presided at the transportation session. "Motive Power" was the subject of Alba B. Johnson, president Baldwin Locomotive Works; "Terminals," that of John F. Wallace, chairman Chicago Railway Terminal Commission; "Car Supply," Samuel O. Dunn, editor *Railway Age;* "Extensions," Francis H. Sisson, vice-president Guaranty Trust Company, New York. Roy D. Chapin, chairman highway transportation committee of the Council of National Defense; F. A. Seiberling, president Goodyear Tire & Rubber Company; A. C. Bedford, president Standard Oil Company of New Jersey and chairman of the petroleum war service committee, and M. H. G. Shirley, chief engineer State Roads Commission of Maryland. were other speakers.

Edward A. Filene, chairman of the war shipping committee of the Chamber of Commerce, presided at the session to consider shipping problems. "How Can We Get More Ships in the Next Six Months?" was discussed by Charles Piez, vice-president and general manager Emergency Fleet Corporation; "Patriotic Labor," by Dr. Charles A. Eaton, national service department, Emergency Fleet Corporation; "Big-Scale Shipbuilding," by Joseph W. Powell, vice-president Bethlehem Shipbuilding Corporation; "The Rochester Plan," by James T. Hutchings, general manager and vice-president Rochester Railway & Light Company; "Reducing Ship Labor Turnover," by Meyer Bloomfield, head of the industrial service department Emergency Fleet Corporation; "The World's Ship Labor," by Crawford Vaughan, ex-Premier of South Australia; "The Fabricated Ship and Its Part in the War," by George J. Baldwin, president American International Shipbuilding Corporation.

Following these specialized discussions there was a general conference on Thursday afternoon under the chairmanship of B. D. Caldwell, war shipping committee, New York, dealing with the following topics: "Should Business Men Help the Transference of Their Skilled Employees to Shipyards?" B. F. McLeod, Charleston, S. C., and N. Sumner Myrick, vice-chairman National War Shipping Committee; "What Can the Local Business Organizations Do in Helping to Provide Adequate Transportation Facilities for Ship Workers?" Philip H. Gadsden, president Charleston Light & Power Company, Charleston, S. C.; "What Can the Local Organizations Do to Provide Adequate Housing Facilities for the Ship Worker for the Next Six Months and Thereafter?" J. R. Flannery, manager division of general service, Emergency Fleet Corporation, and Bert L. Fenner, head of production department, Department of Labor; "What Can Business Organizations Do to Express Their Appreciation of Ship Workers and Their Work as an Encouragement to Utmost Effort?" V. Everit Macy, chairman adjustment board, Department of Labor; "What Can the Local Business Organization Do to Make Two or Three Shifts in the Shipyards Possible?" Holden A. Evans, president Baltimore Dry Dock & Shipbuilding Company, and J. B. Weaver, manager Harlan plant, Bethlehem Shipbuilding Corporation.

The feature of Thursday's session was the address of the British Ambassador in the evening. Friday was given over to a war convention of secretaries. Throughout the entire convention there was manifest a spirit of determination to subordinate all business to the great business of winning the war and that quickly. Patriotic enthusiasm bubbled from every speaker and optimism was everywhere apparent.

ADDRESS OF MR. MCCARTER

Mr. McCarter showed in his address the vital importance of utilities to the country, saying in part:

If this country is ultimately to take its place in the forefront of the Allies and be the final decisive factor in the termination of the world war, as we all believe, the integrity of the utility industry of this country must not only be preserved but its activities must be speeded up to a point never hitherto attained; its capacity for service must be greatly increased, and the capital necessary to accomplish this result must be provided. The power companies must keep pace with the extraordinary demands being made upon them to furnish power in large quantities to the shipyards, to the aeroplane factories and to the innumerable industries engaged either exclusively in the manufacture of war products or of materials which ultimately become a part of them.

The utilities of the country constitute, if I may make use of the term, no "piker" industry. Viewed from every angle —from that of service rendered, from that of annual income, and from that of capitalization—they constitute a highly important factor in the economic life of the nation. They daily furnish the public with necessities of modern civilization. Their securities are owned by millions of people, as well as by financial institutions. It would be difficult to find a banking institution in the country that would not be embarrassed by a permanent collapse of the credit of these utilities. Like those of every other industry in the country, their costs over pre-war conditions have enormously increased. It is susceptible of proof that their labor and material costs have increased by an average of 70 per cent. Unlike the ordinary private industry, however, they have not been able to "pass the buck" of increased costs to the consumer.

There is now a country-wide movement under way by the utilities for increased revenue. In many cases, I am happy to say, the state commissions are facing the issue courageously and granting the necessary increases; but if widespread disaster is to be averted, a public spirit of fairness and justice to these companies must be developed that will quickly manifest itself in commission decisions.

Invest Safely—Buy Liberty Bonds

LABOR AND CAPITAL UNITED FOR THE WAR

BY LOYALL A. OSBORNE,

Vice-President Westinghouse Electric & Manufacturing Company

[At the request of the Electrical World Loyall A. Osborne, vice-president Westinghouse Electric & Manufacturing Company, and chairman of the executive committee of the National Industrial Conference Board, made a statement on the work of the Commission of Employers and Workers, of which he was a member representing the employers. The report of this commission was published in part in last week's issue, page 736. Mr. Osborne's statement follows.]

The significance of the agreement reached by the commission of employers and employees lies in the fact that in the face of a great national emergency two groups whose views have been popularly believed to be irreconcilable have met and by discussion and concession agreed upon a program that fully protects not alone the legal rights of both groups but the cherished principles for which they have most tenaciously contended.

The cardinal principle upon which the commission proceeded in its deliberations was that there must be no interruption to the production of war essentials by acts to prevent which lay within the control of either employer or employee.

This meant that for the period of the war there should be no lockouts or strikes.

If labor is to relinquish the principal weapon by which it has heretofore secured compliance with its demands, it becomes necessary that there be created a tribunal through which both the worker and the employer shall be guaranteed that every just grievance shall have a hearing and be settled fairly and in accordance with a body of agreed-upon principles.

This, I believe, the program insures.

If the leaders of labor throughout the country are, as I believe them to be, of the same high-minded and patriotic type as their representatives with whom I had the honor and good fortune to sit in conference, I am sure there will be no difficulty that the machinery provided cannot compose with impartial justice to all parties.

Speaking for employers, I am confident that they will whole-heartedly support the program agreed upon by their representatives. I have construed my presence on the commission and my agreement to the program as a pledge of the great national associations of manufacturers represented on the National Industrial Conference Board, which sent me there, that employers will observe the letter and spirit of the understanding.

I cannot express too highly my appreciation of the invaluable services rendered to the commission by the representatives of the public, ex-President Taft and Frank P. Walsh. Their counsel was of the utmost value to the other members in all of the difficult and complex questions that formed the subject of discussion.

Second only to the army of our brave fighting men is our great productive industry, and if we can maintain a condition of industrial peace at home through the medium of the agreement now reached, as I firmly believe we will, no American need doubt the successful outcome of our national effort.

Uncle Sam Pays—Buy His Bonds

Some Day The Fuel Question May Be Settled

—*Knoxville (Tenn.) Tribune*

SIGNALING APPARATUS WORK IN ASSOCIATED MANUFACTURERS

New Section Effects Further Organization by Appointment of Committees to Take up Activities in Many Lines

The Signaling Apparatus Section, which was formed recently in the Associated Manufacturers of Electrical Supplies, held its second meeting at the association rooms, New York, on April 5.

George L. Patterson of Stanley & Patterson, Inc., New York, is chairman of the section, with R. Edwards, Jr., of Edwards & Company, Inc., New York, secretary and E. Whitmore of the Manhattan Electrical Supply Company, New York, treasurer. The following standing committees were appointed in the section:

Committee on Annunciators.—E. Ward Wilkins, chairman, Partrick & Wilkins Company, Philadelphia; T. W. Ness, Holtzer-Cabot Electric Company, Boston; R. Edwards, Jr., Edwards & Company, Inc., New York.

Committee on Small Bells and Buzzers.—W. J. Tonkin, chairman, Ansonia Electric Company, Ansonia, Conn.; C. P. La Shelle, W. R. Ostrander & Company, New York; E. Whitmore, Manhattan Electrical Supply Company, New York.

Committee on Contact Devices.—E. Whitmore, chairman, Manhattan Electrical Supply Company, New York; W. J. Tonkin, Ansonia Electrical Company, Ansonia, Conn.; Albert S. De Veau, Stanley & Patterson, Inc., New York.

Committee on Fire Alarm Apparatus.—Vernon Durbin, chairman, Holtzer-Cabot Electric Company, New York; G. L. Patterson, Stanley & Patterson, Inc., New York; R. Edwards, Jr., Edwards & Company, Inc., New York.

Committee on Signal Gongs.—G. L. Patterson, chairman, Stanley & Patterson, Inc., New York; T. W. Ness, Holtzer-Cabot Electric Company, Boston; R. Edwards, Jr., Edwards & Company, New York.

Committee on Telephone Apparatus.—B. C. Rogers, chairman, Connecticut Telephone & Electric Company, Meriden, Conn.; A. S. De Veau, Stanley & Patterson, Inc., New York (one member still to be appointed).

Committee on Telegraph Instruments.—E. Whitmore, chairman, Manhattan Electrical Supply Company, New York (two members still to be appointed).

Membership Committee.—C. P. La Shelle, chairman, W. R. Ostrander & Company, New York; E. Ward Wilkins, Partrick & Wilkins, Philadelphia; M. J. McElroy, Holtzer-Cabot Electric Company, New York; B. C. Rogers, Connecticut Telephone & Electric Company, Meriden, Conn.; W. J. Tonkin, Ansonia Electric Company, Ansonia, Conn.

Another meeting will be held at an early date, when the various committees will have plans formulated for active work along the different lines already suggested. It is felt that this section will be a very important one in the industry covered.

ILLUMINATING ENGINEERING ACTIVE WAR SERVICE WORK

In Many Ways the Society Has Aided the Government Since War with Germany Was Declared

A bulletin has been issued by the Illuminating Engineering Society telling in general terms of the war service work done by members.

As soon as war was declared the society offered its services to the government. Since then it has lost no opportunity to be of service. Its committee on war service, acting upon requests received directly or through the National Committee on Gas and Electric Service, has designed lighting installations for various departments of the government. The committee has also prepared a treatise on protective lighting at the request of government officials.

Members nominated by the society, constituting the divisional committee on lighting under the committee on labor, of the Council of National Defense, have prepared a treatise on industrial lighting for application wherever work is done under contract with the government. Lighting experts for each state in the Union have been selected to co-operate.

The National Research Council has availed itself of the services of the society's experts in prosecuting its researches on problems of lighting and vision. The society's membership has been classified so that the government may have ready access to lighting specialists.

Showing that light properly controlled is a very important instrument for winning the war, the society says:

"At the front or on the sea it reveals and locates the enemy, his works, operations, submarines. It also conceals our own operations by camouflage or glare. It conveys intelligence by signals, even in the daytime. At home it protects buildings, piers, bridges and other works; it speeds production and prevents waste. It prevents accidents which jeopardize life and material. It conserves eyesight; gives cheer and comfort to workers."

NATIONAL COMMITTEE ON PUBLIC UTILITY CONDITIONS

Action by Executive Committee of National Electric Light Association to Give Direction to Work Under Way

At a recent meeting of the executive committee of the National Electric Light Association it was decided that a committee of three members should be appointed to co-operate with similar committees of the electric railway and gas industries in the formation of a conference or joint committee to advise in regard to such utility problems of national interest as may be specifically assigned for consideration. This suggestion arises from the desire to give specific direction and authority to the work which is being done now by the National Committee on Public Utility Conditions, representing the N. E. L. A., American Electric Railway Association, American Gas Institute and National Commercial Gas Association.

President J. W. Lieb reported at the meeting that the association, in the referendum of the Chamber of Commerce of the United States on water-power development, has given its affirmative vote for the proposed legislation by Congress. The committee approved the action.

Twenty-seven additional central stations have been admitted as members, also 773 Class B members, 13 Class D members, 76 Class E members and 3 foreign members.

HIGHER RATES ARE NEEDED IN CALIFORNIA

Power Companies Ask Commission to Apply Increases to All Consumers, Instead of to Selected Classes

The application which is now pending before the California Railroad Commission for a 20 per cent increase of rates on electric service for industrial plants, irrigationists and commercial lighting has been amended by the appellants, who ask that the increase apply to all classes. All of the power companies serving central California districts are affected.

Attorney B. D. Marx Greene, representing sixty California cities, asked the commission to order cancellation of all special contracts between the Great Western Power Company and the Pacific Gas & Electric Company and preferred consumers.

Mortimer Fleishhacker stated for the Great Western Power Company that if the schedule rate were to be applied to holders of special contracts the company's income would be increased between $100,000 and $200,000 annually.

Public utility men should regard it as both a duty and a privilege to subscribe for Liberty bonds to the fullest extent of their ability. They know from their own experience that ready and ample capital is essential to efficient and quick results in large undertakings. Our government has on its hands the largest undertaking in its history. The abundance or lack of money will determine the assurance or the difficulty of the early fulfillment of its war program, the complete success of which is essential to the safety of our citizenship and the preservation of humanity in the world.

W. W. FREEMAN,
President Union Gas & Electric Company, Cincinnati.

PLAN TO INTERCONNECT PLANTS IN OHIO DISTRICT

War Industries Board Interested in Arrangement to Effect Improvement in Power Supply for Group of Cities

A report from Alliance, Ohio, indicates that the War Industries Board is working on a plan of tying in the central stations of Pittsburgh, Youngstown, Niles, Warren, Akron, Alliance, Canton and Massillon in order to insure continuous power for manufacturers of mnuitions and war materials in the district. Several of these cities are already connected by high-tension lines and the plan would provide for lines between the others mentioned. Army engineers, it is said, have about completed a survey of the cities and will report soon to the board.

The shortage in the district is placed at 125,000 kw., and it is said that several plants will be enlarged to meet this need. One will be the large plant of the American Gas & Electric Company and West Penn Power Company at Windsor, W. Va. In addition, the plant of the Doherty interests at Bolivar, Tuscarawas County, Ohio, is to be completed. The two will supply about 80,000 additional kilowatts.

Should the government demand additions to plants, it is supposed that some plan will be provided to furnish funds.

Invest and Do Your Fair Part

SERVICE CHARGE RATE IN STATE OF NEW YORK

Empire State Gas & Electric Association Anxious to Prevent Public Misunderstanding Where This Charge Is Introduced

The Empire State Gas & Electric Association has printed a booklet on the "Service Charge Rate," which it has sent to electric and gas companies in New York State.

A letter accompanying the booklet, signed by the executive committee of the association, says that on account of rising costs many companies are finding it necessary to increase their rates, and in this connection some have adopted a method of charge consisting of a service charge plus a commodity charge, while others now have the matter under consideration.

As this is a very important subject, affecting not only individual companies but the entire industry in the State, it was deemed advisable to prepare the general discussion of the service charge rate, to which very careful attention is requested.

The executive committee is deeply interested in this matter and in seeing to it that whenever a service charge rate is established the method of procedure shall be such as will not prejudice the public against the form of rate or prevent the company from being able to justify it before the commission.

On April 19, 1917, the committee after careful consideration passed the following resolution:

"Resolved, that the executive committee approve the plan of a demand, service or customer charge plus a commodity charge for gas and electric rates."

On Nov. 22, 1917, this resolution was expanded thus:

"Further resolved, that the inclusion of the service charge in any change of rates should carefully be specified to be based on costs properly entering into such charge, which costs have heretofore been inequitably and disadvantageously obtained through the commodity charge, and should not be included merely as a means to increase revenue."

The above amendment was occasioned by an apparent misunderstanding of the matter on the part of some companies, but in a number of recent instances the method of procedure employed by the companies in establishing this form of rate has indicated that, in spite of the above resolution, the subject is not yet clearly understood and that some further explanation is necessary in order that mistakes may be avoided.

The committee expresses the hope that the discussion will clarify the question, will encourage the adoption of this method of charge where the circumstances and conditions warrant, but will prevent its adoption without full ascertainment of the facts and a convincing explanation to consumers.

"Liberty or Death"—Liberty Bonds

GREAT PROGRESS BEING MADE IN ELECTROCHEMISTRY HERE

C. F. Burgess, Addressing Chicago A. I. E. E. and Western Society of Engineers in Joint Session, Tells of Accomplishments in the Art

C. F. Burgess of Madison, Wis., who is now spending much of his time as an electrochemist for the government at Washington, spoke before a joint meeting of the American Institute of Electrical Engineers, Chicago Section, and the Western Society of Engineers, on March 25.

The features of the address were the speaker's emphatic statements that wonderful progress is being and has been made by United States electrochemists since war began in spite of all enemy statements and inferences to the contrary, and his equally emphatic avowal of the necessity for more electrochemical work to win the war.

Choose the Best—Liberty Bonds

N. E. L. A., Pacific Coast Section

The joint convention of the Pacific Coast Section, N. E. L. A., California Association Electrical Contractors and Dealers, and the National Electrical Supply Jobbers' Association of the Pacific Coast will be held at Del Monte, Cal., May 9-11, 1918. As noted in the ELECTRICAL WORLD for March 23, this convention, which had been planned for April 24-27, was postponed to avoid interference with the Liberty Loan campaign.

Annual Meeting of Society for Electrical Development

The annual meeting of the Society for Electrical Development, Inc., will be held on Tuesday, May 14, at 11 a. m., at the offices, in the Engineering Societies Building, 29 West Thirty-ninth Street, New York.

San Francisco Electrical Development League.—At the luncheon of the league on April 3 Gen. C. A. Woodruff gave a talk on "How We Can Help."

Buffalo Engineering Society. — On April 17 the Buffalo Engineering Society will devote a meeting to discussions regarding electrical and chemical engineering subjects.

A. S. M. E., St. Louis Section.—On March 29 the St. Louis Section of the American Society of Mechanical Engineers elected Louis Gustafson chairman and J. P. Morrison secretary.

A. I. E. E., Portland Section.—At a recent meeting of the Portland (Ore.) Section of the American Institute of Electrical Engineers J. B. Fisken talked on "Changes in Distribution System on Account of Range Load."

I. E. S., Philadelphia Section.—At a meeting of the Illuminating Engineering Society at Philadelphia M. Luckiesh of the Nela Research Laboratory, Cleveland, Ohio, gave an interesting talk on the "Esthetics of Street Lighting."

Jovian Electric League, Los Angeles, Cal.—At the March 27 meeting of the league E. S. Parker, manager of the Knox School of Business Efficiency and Salesmanship of Cleveland, Ohio, spoke on "Salesmanship That Concerns Everybody on the Payrolls."

Electrical Supply Jobbers' Association.—The date of the tenth annual meeting of the Electrical Supply Jobbers' Association at the Homestead Hotel, Hot Springs, Va., has been changed from May 28, 29 and 30, 1918, to May 21, 22 and 23, 1918.

Engineers' Society of Milwaukee.—At the April 10 meeting of the Engineers' Society of Milwaukee Charles L. Fortier, chief engineer of the Johnson Service Company, gave an illustrated talk on "Automatic Control Apparatus for Temperature Regulation."

A. I. E. E., Indianapolis-Lafayette Section.—E. P. Shepard of the Bureau of Standards delivered an address on "The Work of the Bureau of Standards," with special reference to electrolysis and its mitigation, before the Indianapolis-Lafayette Section of the American Institute of Electrical Engineers.

National Association of Electrical Contractors and Dealers.—The officers and executive committee of the National Association of Electrical Contractors and Dealers held a three-day session in Detroit on April 1, 2 and 3. It was attended by a large number of contractors from Detroit and the rest of Michigan, and also by a considerable number of important men in the electrical industry.

A. I. E. E. in Joint Meeting.—A very interesting meeting of all the engineering societies of San Francisco, consisting of civil engineers, mechanical engineers, chemical engineers, mining engineers and electrical engineers, was held recently. P. M. Downing, chief engineer of the Pacific Gas & Electric Company, delivered an address on "Interconnections of Power Plants," and D. M. Foulson talked on "Fuel Oil Saving."

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month on the next-to-last text page.

Minnesota Electrical Contractors' Association.—Dean John R. Allen of the College of Engineering and Architecture, University of Minnesota, spoke on "Electrical Conditions in Europe Before the War" at the convention of the Electrical Contractors' Association of Minnesota. At the business meeting of the association it was decided that the old officers should remain in office until the regular meeting in June. W. L. Goodwin spoke on the Pacific Coast merchandising plan and answered questions concerning it.

Southwestern Electrical and Gas Association.—The annual convention of the Southwestern Electrical and Gas Association, to be held in Galveston April 15 and 16, as previously announced in the ELECTRICAL WORLD, will consider some vital problems which have been forced upon public utility plants by war conditions. The increased and still increasing cost of fuel, material and labor, the possibility in the near future that prices may be still further increased, and the inability on the part of the public utilities to obtain these commodities will be the more important subjects. Labor and the demands of the government in the matter of taxation on gross earnings and profits will also be discussed.

Oklahoma Gas, Electric and Street Railway Association.—The annual convention of the Oklahoma Gas, Electric and Street Railway Association will be held at Oklahoma City on April 22 to 24 at the Lee-Huckins Hotel. Among the interesting papers to be presented will be "Electricity in Oil and Gas Fields," by L. E. Mohrhardt, Southwest Gas & Electric Company, Oklahoma City; "High-Tension Transmission and Distribution," by Lee Boyer, Choctaw Power & Light Company; "Gas-Fired Boilers," by L. A. White, Muskogee Gas & Electric Company; "Present Trend in Rate Making and Valuation," by H. N. Strait, H. M. Byllesby Company; "Relations of Utilities to the Public," by A. L. Mitchell, engineer for State Corporation Commission; "Needed Utility Legislation," by Charles Hoopes, Oklahoma Railway Company; "Utility Taxation," by Prof. F. F. Blachly, University of Oklahoma; "Relations to Customers," by R. K. Johnston, Washita Electric Company, and W. J. Dibbens, Guthrie Gas, Light, Fuel & Improvement Company; "Oklahoma Utilities and War Problems," by Prof. L. W. W. Morrow, University of Oklahoma, and Guy B. Treat, Oklahoma Railway Company. In addition association policies for 1918 will be discussed and the question box will be opened. Officers will be elected.

A. I. E. E., Schenectady Section.—Lieut.-Col. Nugent H. Slaughter, Signal Corps, U. S. A., delivered an address on "Army Radio Communication" before the Schenectady Section of the American Institute of Electrical Engineers on April 5.

A. I. E. E., Toledo Section.—The regular monthly meeting of the Toledo Section of the American Institute of Electrical Engineers will be held at the Scott High School auditorium on Wednesday, April 17. E. E. F. Creighton will speak on "The Theory and Practice of Lightning Protection."

A. I. E. E., Utah Section—John H. Lewis, state engineer of Oregon, delivered an address on "Western Development and Its Relation to National Transportation Policies," on March 20, before a joint meeting of the Utah Section of the American Institute of Electrical Engineers and the Utah Society of Engineers. He said that "only through development of hydroelectric resources on a vast scale, with the aid of the federal capital, will the United States be saved from industrial disorganization after the war." By means of electrification of the railroads at this time the transportation facilities of the country can be immediately organized on a war-time basis. The development of electrical energy in large centralized water-power or steam plants by the federal government and its sale at approximate cost in wholesale blocks at important industrial centers to run the railroads and industries of this country is a national economy. This must be worked out if the United States is to survive the bitter industrial war to follow the close of the present war.

National Electrical Contractors and Dealers' Association, Connecticut Section.—At a meeting of the Connecticut Section of the National Electrical Contractors and Dealers' Association on March 27 James R. Strong, chairman of the advisory committee of the national association, read several letters from some of the large manufacturing companies, pledging themselves to an established differential between the industrial plants and the contractor and jobber. Isolated plants and industrial plants are to pay the consumers' prices for electrical machinery and materials, and shipbuilding companies and construction companies of like nature will have to pay the contractor's price. It is thought by the association that this differential will have a favorable effect upon the industry as it means fair competition to the jobber and the contractor. At a dinner given by the association W. L. Goodwin gave a talk on the so-called Goodwin plan and answered questions about it. The meeting was presided over by the state secretary, George M. Chapman, instead of E. A. Francis, who was unable to attend on account of illness. The meeting was attended by all branches of the electrical industry, consisting of seventy-five contractors, fifty-two manufacturers' representatives, twenty-seven jobbers and nineteen central-station men.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Municipal Capital Issues.—The capital issues committee of the Federal Reserve Board announces that, upon the recommendation of its advisory committee, in view of the large aggregate of municipal issues offered in relatively small amounts, it has decided to reduce from $250,000 to $100,000 the minimum limit on municipal issues upon which it will give advice with respect to the question of whether or not such issues at this time are compatible with the public interest.

New Hydroelectric Service Saving Coal.—By the shutdown on March 19 of the Margaret Street generating plant of the Springfield (Mass.) Street Railway and the operation on this site of a substation of the Turners Falls Power & Electric Company supplying the city lines through step-down transformers and motor-generator sets, a great improvement in service has been effected. The estimated saving in coal is 100 tons per day. Mayor Stacy, members of the City Council and of the Springfield Chamber of Commerce inspected the substation recently as guests of President C. V. Wood of the railway company.

Mountain States Power Company.—The Mountain States Power Company has acquired all the property of the Northern Idaho & Montana Power Company in Oregon, Washington, Idaho and Montana. The property operating as the Oregon Power Company, with headquarters at Eugene and Marshfield, Ore., will continue to operate under that title. The properties with headquarters at Kalispell, Mont., and Sandpoint, Idaho, will operate under the name Mountain States Power Company. The company will be under the operating direction of Elmer Dover, vice-president of H. M. Byllesby & Company, with headquarters at Tacoma.

Flatbush Electric Rates. — Figures tending to show that its operating costs have greatly increased within the past few months and that inferentially it is not in a position to offer reductions in its rates for electricity have been placed in evidence by the Flatbush Gas Company before the New York Public Service Commission for the First District. The occasion of their presentation was the rehearing granted by the commission upon its recent order directing the company to reduce its electric rates from a maximum of 12 cents to 10 cents on March 1, 1918, and to make other reductions to a maximum of 8 cents by March 1, 1919. The company has refused to accept the commission's order, and announced that it would demand a rehearing and would take such steps as were possible to prevent the order from going into effect.

Radio Course in University of Pennsylvania.—The University of Pennsylvania is planning to add to the curriculum of the Electrical Engineering School a new course in radio communication especially adapted to fit students for enlistment in the Signal Corps of the United States Army. Announcement of the new course has just been made by Dr. Harold Pender of the faculty, and a large enrollment is anticipated. Upon completion of the course, students enlisting in this branch of service will be sent to special government schools for further training, where opportunities for qualifying as noncommissioned officers, with possible advancement to commissioned grades, will be afforded.

Men Needed in Ordnance Office.—Men are needed for the requirements section of the Control Bureau, Ordnance Office, War Department, of which section Lieut.-Col. M. C. Rorty is in charge. This section is charged with the responsibility of estimating quantities and delivery dates for all purchases of ordnance material, amounting to many hundreds of millions of dollars per annum. The men should be capable of analyzing a variety of facts in relation to the needs for such material and presenting sound conclusions as to the purchases that should be made. They should in general be college graduates and ordinarily should be men who ranked in college from a scholastic standpoint in the upper 25 per cent of their classes. The men should have had experience in preparing estimates or reports on which their reputation has rested and on the basis of which substantial money expenditures have been made.

Cincinnati Needs Amendment of Rate Agreement.—The Union Gas & Electric Company, Cincinnati, has sent to the Ohio Public Utilities Commission a motion to reopen its appeal from a city rate ordinance which was settled by agreement in February, 1917. President W. W. Freeman and Attorney Miller Outcalt first notified Mayor Galvin of their intention to do this unless some arrangement could be made to allow an increase over the present maximum rate, 8½ cents per kilowatt-hour. An ordinance fixing this figure was enacted by the council in 1915, and the company appealed to the Public Utilities Commission. Then a settlement was reached on the rate fixed by the ordinance. Mayor Galvin informed President Freeman that the city would oppose any change or increase. He said that the appeal, which was settled by agreement, cannot be legally reopened. The agreement provided that the above rate should continue for five years and that at the end of that time either side should have the right to an appeal from its provisions for the next five years, the contract covering ten years. President Freeman stated that the company lost several thousand dollars last year and cannot go on losing.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies.

Apparatus Must Prevent Injury to Customers During Lightning Storms.—A city furnishing light was bound to employ such approved apparatus in general use as would be reasonably necessary to prevent injury to a customer using its light arising from lightning conducted into residence, the Court of Appeals of Georgia held (94 S.E. 637). An amended petition in action for personal injury, based on incapacity of defendant's transformer to reduce primary current of high voltage so as to permit a safe current of low voltage to pass into light wires entering plaintiff's home, was held to state a cause of action.

Cost of Acquiring Customers in Valuation Proceedings.—Upon a valuation by the Public Utilities Commission, pursuant to the General Code, with a view to a city's use in the framing of a new ordinance fixing maximum rates following the expiration of an agreement between it and certain electric companies furnishing electricity in the city, the inclusion in the final valuation of an item scheduled as "costs of attaching business, $375,000," conceded to represent the cost of acquiring customers, was erroneous, as, in view of varying circumstances which in advance would be purely hypothetical, the valuation was necessarily uncertain, theoretical and somewhat arbitrary, the Supreme Court of Ohio held in City of Cincinnati versus Public Utilities Commission of Ohio (118 N.E. 97).

Distance Between Tower and Telephone Lines.—That an electric company operating a power line and a telephone line constructed them as far apart as required by statute does not necessarily render it free from negligence in maintaining them at such distance, the Supreme Court of California held in Sickles versus Mount Whitney Power & Electric Company (170 P. 599). Where an electric company operating a telephone line and a power line knew of and consented to another company moving its telephone line to a position near its power line, it is liable for damage done by reason of their subsequently coming in contact with each other and burning a house. Where two electric companies are equally liable for damages done by wires coming in contact, one cannot complain that verdict was returned against it alone, because each was independently liable and the jury can find for one defendant and against the other. Where, by reason of negligence of an electric company, plaintiff's house was burned, the measure of damages by law was the value of the property destroyed.

R. **W. Spofford**, general manager of the Augusta-Aiken Railway & Electric Corporation, Augusta, Ga., who is a retired officer of the United States Navy, has been called to active service. W. C. Callaghan succeeds him as general manager. Mr. Callaghan has been with the J. G. White Management Organization, New York City, the operator of the Augusta company since 1913.

W. P. Southard, manager of the Albuquerque (N. M.) Gas & Electric Company, has been transferred by the parent company, the Federal Light & Traction Company, to Trinidad, Col., to manage the Trinidad Electric Transmission, Railway & Gas Company, succeeding E. C. Deal. Mr. Southard has been manager of the Albuquerque property for the last three years. Prior to that he was manager of the Las Vegas Light & Power Company, another company under Federal Light & Traction control.

Samuel W. Greenland, general manager of the Northern Indiana Traction Company and an electrical engineer of considerable prominence, has obtained a leave of absence in order to supervise the construction of a government power plant at Baltimore, Md., to be used in connection with a munition factory. The plant, it is understood, will have a rating of 20,000 kw. Mr. Greenland since the beginning of the war has taken a prominent part in his home city, Fort Wayne, Ind., in patriotic work such as Liberty loan drives, Red Cross campaigns, Y. M. C. A. work and boys' working reserves.

Weare Parsons, who has resigned as treasurer and manager of the Springfield (Ohio) Light, Heat & Power Company, has been engaged in public utility work since the very early days of telephoning. He began his career at Burlington, Iowa, in the early 80's. After spending approximately twelve years in the construction of telephone, electric light and street railway properties, during a part of which time he was with the Westinghouse Electric & Manufacturing Company's Chicago office, he joined the staff of the Western Electric Company. He remained approximately nine years with that concern, and for two and one-half years of that time operated an electric light property controlled by the Western Electric Company at Rutland, Vt., which was known as the Marble City Electric Company. Following that period he went to Joplin, Mo., in charge of the property of the Southwest Missouri Light Company, and for five and one-half years divided his time between that concern and the Keokuk Railway & Light Company of Keokuk, Iowa. Later he became connected with a Chicago bond house known as A. J. Whipple & Company. Leaving that concern, he was employed by the Springfield Light, Heat & Power Company, and during his seven and one-half years of service saw steady progress in the growth of that concern. He is at present enjoying a long-delayed vacation prior to taking up work again in the industry.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

John R. Ruggles, former assistant electrical engineer of the Acme Power Company, Toledo, Ohio, is now general superintendent of the Durham (N. C.) Traction Company.

S. M. Moore, for the last six years on the staff of the New Haven (Conn.) office of the General Electric Company, has been appointed service manager of the power equipment department of the New England Engineering Company, Waterbury, Conn.

Samuel Insull, president of the Commonwealth Edison Company, received word April 8 of the death on April 5 of his mother, Mrs. Emma Insull, in London. Mrs. Insull was in her eighty-fourth year. She is survived by five children, Samuel and Martin J. of Chicago; Joseph, whose home is in Pittsfield, Mass.; Mrs. James McAdam and Miss Emma H. Insull of London. Prior to the war Mr. Insull was in the habit of visiting his mother from two to four times a year.

W. A. Brackenridge, vice-president and general manager of the Southern California Edison Company, Los Angeles, Cal., has been elected president of the company. Mr. Brackenridge, who is a well known hydraulic engineer, went to Los Angeles in the summer of 1909 to take the management of the predecessor company, the Edison Electric Company of Los Angeles. Prior to that he was a member of the advisory board of consulting engineers of the new barge canal in New York State.

Le Roy Clark, president of the Safety Insulated Wire & Cable Company and chairman of the Wire and Cable Section of the Associated Manufacturers of Electrical Supplies, has been appointed a member of the War Industries Board, of which he will be chief of the wire and cable section of the finished products division. This has necessitated the resignation of Mr. Clark as chairman of the war service committee of wire and cable manufacturers, although he will continue with official recognition the work he has been doing as chairman of this committee. All orders by the government and the Allies, and eventually, should conditions warrant, all commercial orders, for wire and cable henceforth will be placed before Mr. Clark for allocation among the manufacturers. Mr. Clark, who was born in 1872, upon graduation from Columbia University in 1894 in electrical engineering became permanently connected with the wire industry. He has always been in the employ of the Safety Insulated Wire & Cable Company, starting as electrical engineer in 1894 and becoming president of the company in 1906.

Obituary

George J. Jackson, president of the National Conduit & Cable Company, died on Monday morning of heart trouble at his home in New York City in his fifty-seventh year. Mr. Jackson has been prominently identified with the cable industry for many years, having been prior to that engaged in the wholesale dry goods business as an importer. His first connection with the wire field was with the Norwich Wire Company, a small concern which he had purchased. About twenty years ago this company was bought out by the National Conduit & Cable Company and Mr. Jackson was retained as secretary. He had continued in this capacity until last month, when he was elected president on the retirement of E. S. Perot.

R. W. Blackwell, president of R. W. Blackwell & Company and Johnson & Phillips, cable and electric supply manufacturers, London, England, died in that city on March 29. Mr. Blackwell was born in New York City on Jan. 27, 1858. He was educated at Andover Academy, Princeton, class of 1879, and Columbia Law School, class of 1881. He was associated with R. R. Hazard in the Gramme Electric Company, a combination of all the early electric companies. He was also associated with Mr. Hazard and with W. B. Parsons in the first proposed underground railroad in New York. He was one of the organizers in 1883 of the Bentley-Knight Electric Company, of which he was president. Mr. Blackwell went to England in 1888, where he formed the importing and contracting firm of R. W. Blackwell & Company, which built the first electric railways in England and equipped them with American apparatus.

Capt. Henry N. Brooks, a member of the United States Engineers Reserve Corps, whose death in France of pneumonia has just been announced in a cablegram, was prior to enlisting an electrical engineer with James N. Hatch, consulting engineer, Chicago. He went to France last December and was stationed in a small village as engineer depot officer, in charge of a large engineer supply depot for the United States Army. He was a graduate of the engineering college of Cornell University in the class of 1888 and was one of the pioneers in the electrical railway engineering field. One of his first jobs was as an electrical engineer on the electrification of the car lines in Philadelphia in 1892 and 1893. During his career he also operated an electric railway property in Florida and was at one time employed in electric railway work by the Westinghouse Electric & Manufacturing Company. He afterward had charge of the construction of the interurban line from Grand Haven to Grand Rapids, Mich. He was for eight years electrical engineer for the firm of Sargent & Lundy of Chicago. He had been with James N. Hatch for two years prior to his enlistment in the army last June. Mr. Brooks's father was the late Admiral William B. Brooks, U. S. N.

TRADE & MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies— Notes on Industrial Activities and Business Methods

TRADE PROTECTION IS GROWING IN THE EAST

Preferential Discounts and Quantity Discounts Together Are Expected Materially to Strengthen Trade Distribution

Quantity purchase discounts have for a long time been used in the electrical jobbing field, but not too closely adhered to. There has been the old-time conflict between preferential or protective discount on the one hand and quantity discounts on the other. At the present time, however, the tendency seems to be firmly toward a strict adherence to the quantity purchase plan together with a trade preferential.

It has long been felt that retailers in the trade had been receiving a discount on purchases so small that they amounted to nothing more than retail transactions. There is a growing conviction that the contractor-dealer is not entitled to a discount unless he purchases in discount quantities; that he is not really a merchant unless he accumulates a satisfactory stock; that unless he can purchase in standard package quantities he is not big enough to be classed with contractors. Consequently the often expressed wish that contractors should pay retail prices for retail quantities seems about to bear fruit.

In wholesale purchases, however, a number of jobbers and a few manufacturers in the East have already notified the trade that quantity purchase discounts will prevail with a trade differential in the neighborhood of 10 per cent between contractor and all others.

This is but a beginning, and if it has the desired effect of strengthening the merchandising side of the contractor there is every reason to believe that a better preferential might result. The contractor to-day has practically nothing to do in the construction line and consequently is in an excellent position to give attention to the retail side of electrical merchandising.

Money Points the Way to Victory

TO PREVENT CONFUSION IN GOVERNMENT ORDERING

Requirements Division Created to Collect All Purchasing Information, with Special Sections for Separate Commodities

A new plan of organization of the War Industries Board has been undertaken, the general purpose of which is to prevent confusion and conflict in the ordering and delivering of supplies and to secure unification of the government's policy in dealing with industrial problems. The essential change involved is the creation of a requirements division to which will be furnished information on all contracts, purchases and deliveries, and to which the supply divisions of the purchasing departments and the Allied Purchasing Commission will as far in advance as possible submit statements of their respective needs for raw materials and finished products.

To take charge of particular problems of supply there have been created special commodity sections, and whenever necessary to handle raw materials or finished products of which there is an actual or threatened shortage or the price and production of which should be controlled new sections will be created by the chairman of the War Industries Board. It is the purpose of the chairman of the War Industries Board to make each of the section heads the sole government agency for dealing with the industry for which his section is responsible.

The chief of the commodity section will study the problem referred to his section and will procure from all available sources, including the supply departments, information and data which will be helpful in the allocation of these requirements. At meetings of the commodity section the allocation of materials or facilities to meet the requirements will be determined, and in this distribution the representatives of the various supply departments of the government who are members of the section will have full share.

In addition to dealing with problems referred to them by the requirements division, the commodity sections will have certain definite functions. The first will be the collection of information regarding industrial conditions already mentioned. Further, they will consider from time to time the extent of the existing sources of production, the creation of new facilities, the disclosure—if necessary, the opening up—of additional sources of supply, and the conversion of existing facilities to new uses.

Each commodity section will consider market conditions pertaining to the materials or commodities over which it has jurisdiction and will, where deemed advisable, recommend purchase plans to the several purchasing departments. In cases where it becomes necessary to control an industry in whole or in part by means of allotments, the appropriate section will determine the allotments of materials, commodities and facilities to the several departments of this government and to its allies, and also the extent to which manufacturers and others, whether serving the civilian population or engaged in the manufacture of war supplies, shall be supplied.

Back Up the Boys—Buy Bonds

TRADE ACCEPTANCE PLAN OF CREDIT INDISPENSABLE

Its General Adoption Declared Necessary in Order to Keep Commercial Credit in State of Fluidity and Usability

In an address before the United States Chamber of Commerce convention on Thursday of this week Lewis E. Pierson, chairman of the board of the Irving National Bank, New York City, spoke on trade acceptances, giving opinions arrived at by the American Trade Acceptance Council. The following is quoted from Mr. Pierson's address:

"We believe, and feel prepared to prove, that in the intelligent and consistent use of this method is to be found the possibility of relief from most of the business absurdities and weaknesses which appear inherent in open account procedure.

"We find upon the testimony of hundreds of business men of highest standing, experienced in the use of the trade acceptance method, that obligations expressed in this form almost without exception are paid promptly at maturity.

"Were there no other consistent trade acceptance merits beyond this, and we have discovered many, still we would feel fully justified in appearing before this body and recommending the maximum of activity in the interest of substituting live, liquid, written, respected trade acceptances for the indefinite, imperfectly expressed and casually treated open accounts so common at present in American business.

"To the seller of merchandise we would say that the trade

acceptance is calculated to protect his proper interests to the fullest extent—that it carries with it a definite promise to pay, an acknowledgment of the correctness of deliveries, a shorter term of credit, greater flexibility of assets, better facilities for collection, a logical and improved relationship with customers and practical relief from expensive and burdensome practices which have grown up under the open-account method.

"To the buyer of merchandise we would say that the trade acceptance operates to his distinct benefit—that it gives to him classification as a preferred customer, one who serves notice upon the business world of his disposition and ability to meet his obligations promptly at maturity; that it gives to him greater independence of action; that it provides an effective check against overbuying and overborrowing; that it tends to establish his standing with banks and in the discount market and provides for him a substantially increased field of operations.

"To the nation and to all those properly interested in protecting its interests in the present grave emergency in history we would say that the development of the trade acceptance method in American business is not only important and urgent but indispensable. If we are to win this war and protect the national interest in the world commercial contest which will follow, we must put the business of the nation upon a sounder basis. Not only must our soldiers and sailors fight and suffer and citizens of all classes serve and sacrifice, but the American business man, in his particular field of service, must so direct his energies that this great resource intrusted to his keeping—the commercial credit of the nation—will be kept in such a condition of fluidity and usability that to the fullest possible extent it will serve as an unshakable foundation upon which can be based the greatest effort of the greatest nation the world has known."

Save Lives by Lending—Lend Now

METAL MARKET SITUATION

Higher Prices for Wire Products Freely Predicted—Persistent Efforts to Increase Official Rate

An intimation is going the rounds of jobbing circles that bare copper wire, rubber-covered, cable and weatherproof, may be advanced in price. The copper market is said to be tightening, and therefore a higher government rate will be urged to meet the so-called extra cost of refining and other overhead expense. Instead of the official selling figure for ingot copper being 23.50 cents, advocates of a higher price say it ought to be 25 cents flat. Should this argument prevail, naturally all wire products would follow suit, and while May 30 is the date when the existing price expires, an effort is evidently being made to discount the future. Insiders declare that this is the real reason of the talk about an advance. An authority disputes the necessity of increasing the current cost of the metal by saying, "A good many things may happen to the copper situation between now and June 1, but they will have to be very different from the present comfortable position of supply, demand and profits, we think, to justify higher prices."

NEW YORK METAL MARKET PRICES

	April 1	April 8
	£ s d	£ s d
Copper:		
London, standard spot	110 0 0	110 0 0
Prime Lake	Govt. price 23.50	Govt. price 23.50
Electrolytic	Govt. price 23.50	Govt. price 23.50
Casting	Govt. price 23.50	Govt. price 23.50
Wire base	26.25 to 26.75	26.25 to 26.75
Lead, trust price	7.25	7.25
Nickel, ingot	50.00	50.00
Sheet zinc, f.o.b. smelter	Govt. price 15.00	Govt. price 15.00
Spelter, spot	7.17½	7.17½
Tin, Straits	*85.00	*85.00
Aluminum, 98 to 99 per cent.	Govt. price 32.10	Govt. price 32.10

OLD METALS

Heavy copper and wire	21.50 to 22.00	21.50 to 22.00
Brass, heavy	14.00 to 15.25	14.00 to 15.25
Brass, light	10.50 to 11.00	10.50 to 11.00
Lead, heavy	6.00 to 6.25	6.00 to 6.25
Zinc, old scrap	5.00 to 5.62½	5.00 to 5.62½

*Nominal.

THE WEEK IN TRADE

EXCELLENT business in electrical equipment and staple merchandise is the tenor of advices from various parts of the country. To be sure, purchases and specifications for government work continue to lead the market, but the entire trade is participating in these requirements. Stocks have been depleted and the backward freight deliveries are not easing the situation. Conduit is short everywhere, and there is a strong demand for pole-line material, copper wire, sewing and washing machines and general household electrical appliances. Price changes are announced by individual firms on a number of items. Scarcity of skilled labor is a cause of anxiety in manufacturing centers.

Business is being carried along on a smaller margin of profit than in former years, but it appears to be satisfactory nevertheless. Collections are excellent, in some sections surprisingly good, while fair on an average everywhere. Credits receive close attention.

NEW YORK

Commercial business with the jobbers is not so brisk; in fact, some houses frankly state it is rather flat at present. The government requisitions for all kinds of electrical goods—large and small orders for quick delivery—however, reflect a stage of activity more than compensatory for loss of sales in the regular trade channels. While no special pinch is felt for goods, the orders on manufacturers are no longer small. In certain lines either a full case must be taken or no goods are shipped. The "twelfth part of a dozen" practice, to use the expression of several jobbers, has been abrogated.

Deliveries on commercial orders are not getting better, but going from bad to worse. Jobbers are trying various expedients to place goods in the hands of the dealers in the quickest possible time.

Financially the trade is in a stronger position than for some time, collections growing better with the opening of spring business. The careful scrutiny of credits is maintained rigorously.

LAMPS.—Until further announcement import licenses will be denied on electric lamps. The import trade is very light at present, anyway, less than $4,000 worth coming in in January. The owners of the tungsten lamp patent, on winning their infringement suit, refused to license imported infringing lamps other than those in stock at the time.

HOUSEHOLD SPECIALTIES.—Dealers are said to be stocking up liberally on sewing and washing machines in anticipation of a rapid movement during the late spring and early summer. The price increase of from 10 to 12 per cent which was put into effect April 1 by one concern affected ironing and washing machines, flatirons, glue pots and soldering irons. Deliveries on all this merchandise are from twelve to fourteen weeks behind, and distributers specially interested declare shipping conditions are growing worse.

RADIATORS.—The sharp demand has been caught up with, and surplus stocks are not infrequent.

CONDUIT.—Difficult as it is to get conduit from the mills at Pittsburgh and Youngstown, Ohio, a carload reaches its destination occasionally. It is of little relief to the market, however, and stocks continue low.

SOCKETS.—Though stocks on standard sizes have greatly improved, shipments from the Western manufacturing centers are behind six and eight weeks; New England points, ten days to two weeks. Express facilities are rapidly equaling freight delinquencies, which is partly due to the government commandeering many of the companies' special cars. Some jobbers are meeting the emergency by splitting packages and using parcel post. One large manufacturer states

that, whereas his company was four weeks in arrears on shipments, now an order can be filled and forwarded within a week.

PORCELAIN.—The new price list foreshadowed recently is expected to go into effect about April 15. Stock is difficult to obtain on account of the embargoes, word being received that an ample supply is ready for shipment from the factories. No curtailment of manufacturing has occurred. Jobbers claim to be paying a higher price for porcelain than the government, one leading manufacturer stating that his primary bid was promptly rejected on specifications submitted, with the intimation that unless the prices were reduced the War Industries Board would take over the plant and run it on a "cost-plus" basis. The producer succumbed to the inevitable.

DRY BATTERIES.—The factories are behind on orders, owing to the unusual demand, which is occasioned by jobbers and dealers doubling their requirements on the "safety first" plan. A dealer customarily carrying a dozen batteries on re-ordering increases it 100 per cent, with the jobber following suit to meet his trade's specifications. This occasions the congestion at the factories, which are further handicapped by an acute labor shortage.

REFLECTORS.—An ample supply is reported with no change in prices.

COLLECTIONS AND CREDITS.—Judging from statements of credit managers, collections are holding up, and bills are met with reasonable promptness. This is further proved by the gradual tightening of credit accommodations.

BOSTON

The tide of electrical activity shows little sign of receding, although business is reported to be somewhat quieter in sporadic instances. Jobbers with numerous connections and established in the larger centers are in general very much rushed with orders. Stocks are on the whole in good shape to meet the spring demand, and firm prices insure stable profits under good management. Collections are very fair indeed, despite the dominating influence of the third Liberty loan upon capital outpouring. Jobbers are feeling the shortage of skilled labor not a little, and it would seem that the wider utilization of women in this branch of the industry cannot long be deferred. The expected improvement in freight deliveries on the railroads materializes very slowly. The trade acceptance idea is also slow in gaining ground, especially in the interior. Experience is favorable toward the more extended use of this method of handling credits. It is reported that the National Army cantonment at Camp Devens, Mass., will be enlarged to about double its present troop capacity this year. This, with the army base for which plans are being pushed at Boston, is occupying the attention of the trade.

STORAGE BATTERIES.—Business is excellent, especially in units for automobile service. An enormous trade in second-hand and rebuilt automobiles is getting under way in Massachusetts this year, and more cars are registered than at this time a year ago. Express shipments from Eastern factories are now on a very satisfactory basis, deliveries of three or four days from New York City being not uncommon. No recent price changes are in evidence.

SEWING MACHINES.—Central stations are making a vigorous drive in sewing-machine motors, and the public is responding well. The deferred-payment plan seems to do away with the price question.

FANS.—The large jobbing houses are accumulating fans very rapidly now, and dealers are stocking up fast for over-the-counter deliveries. One of the larger houses has now received 4500 fans out of a total of 5000 ordered, and the next warm spell will find the dealers well prepared to meet the public demand. It is expected that there will be an unusually big sale this summer of the lower-priced fans.

ELECTRIC STOVES.—Interest is growing rapidly in electric cooking, and the smaller, portable stoves are moving unusually well. One central station now has 2000 electric ranges in its territory and has sold 300 of the smaller outfits within a year. Emphasis upon the coal-saving and food-saving advantages of electric cooking makes a patriotic appeal to which many prospective customers listen intently at this time. In suburban towns where no gas supply exists the smaller electric ranges and stoves are arousing unusual interest.

WASHERS.—It is rumored that a price advance may be expected soon on washers. Trade is good in this line.

MOTORS.—Stocks of the smaller sizes tend to increase and prices remain steady. A few of the larger units are now to be found here and there.

CONDUIT.—Some improvement in deliveries from Ohio mills is reported, and "pick-up" shipments from Boston stocks are reported to be fairly prompt to the interior.

APPLIANCES.—Irons are moving well. Portable lamps are very quiet, although good stocks are on hand. Prices are in many cases attractive, and some extra business for summer homes is always in sight at this time.

LAMPS.—Stocks are increasing steadily.

MOTOR-DRIVEN CASH REGISTERS.—These labor-saving equipments are moving well, one Boston department store having purchased over $100,000 worth in the past year with an increase in clerical efficiency of about 20 per cent compared with former cash-carrier methods.

CHICAGO

A checking up of jobbers' business for the first three months of 1918, as compared with the same period last year, shows that the gross on the average was practically the same. It is said, however, that the 1918 business is not a good business. There is less profit in it than there was in the same period of last year, and it is not of the same steady character. One jobber described it as an "accidental" business, meaning that its spotty character as seen in the retrospect made it seem only an accident, caused by a large order or a good week here and there, that the total is as high as it is. The business this last week has been generally quiet. Among the contractor-dealers considerable interest was manifested in the news carried by word of mouth from New York that one large company had rearranged its schedule of discounts in favor of the contractor-dealers in the New York territory.

CONDUIT.—The industrial-plant demand for the larger sizes continues exceptionally strong. There was some relief in the delivery situation this week, but not enough to permit stocks to be replenished.

COPPER WIRE.—Jobbers report it impossible to keep a stock of any type of wire used by industrials. The demand is strong and very steady. Prices remain unchanged, with a slight weakening in discounts by some manufacturers.

TAPE.—An increase in prices has been announced which amounts to about 20 per cent. The higher price of cotton and rubber are given as causes.

PORCELAIN INSULATORS.—High-tension equipment continues to move with rapidity. There are no orders for new lines, but the business for replacements on present lines does not look like small business when it persistently comes in in lots of 50,000 items. Recent factory shipments to France have also helped to hold up the total volume.

ELECTRIC RANGES.—Certain sections of the West are ordering in large quantities. The small-town demand continues strong, with continual evidence that small companies which never before sold ranges are going into the field.

INCLOSED FUSES.—Some manufacturers have recently rearranged their schedule of discounts to protect the contractor-dealer. Certain concerns in the field had been using a schedule of this sort for some time. Such a plan, of course, made it necessary to give the jobber a better price. This recent change has given the jobber a better price by from 5 per cent to 10 per cent. There is no change, however, in the price of fuses to the consumer.

DOMESTIC APPLIANCES.—The market in 32-volt electrical appliances is very active. Manufacturers of 32-volt equipment are finding farm lighting plant manufacturers and distributers very ready to line up with them in the distribution of this merchandise.

ATLANTA

Although the federal government's Capital Issues Committee has passed upon about a quarter of a billion of securities so far, the issues in question covered refunding purposes and no visible effect is felt in this section at present. Residence construction is moving along fairly well in Atlanta, but there is more or less uncertainty in the Southeast regarding the Fuel Administrator's order covering the clay industries. The consensus of opinion is that these products will advance 25 per cent, in view of the curtailment, which will be reflected in building operations. Word has been received to the effect that the Terry Shipbuilding Company, Port Wentworth, Ga., will construct two floating dry docks at a cost of $2,000,000.

The demand for all staple lines is holding up well and considerable improvement is noted in deliveries generally.

POLES AND LINE MATERIALS.—There is a steady demand for poles, and deliveries are much better. Prices remain the same. Sales in hardware continue good. Deliveries have been reduced to four weeks. The demand for carload lots of cross-arms has decreased, but the less than carload lot requirements have increased about 400 per cent. Considerable difficulty is experienced in getting the railroads to accept shipments of this class, and deliveries are being made in approximately three months. Prices advanced 10 per cent April 1. The sale of insulators continues steady in the face of a 10 per cent increase and poor shipments.

CABLE.—The transportation situation is affecting shipments, but on the whole deliveries are slightly better.

TRANSFORMERS.—Although the demand from central stations for capacities up to 25 kva. has fallen off, the volume of business is holding up well when government purchases are taken into consideration. Stocks are getting in better shape. The delivery on the power type is improving.

PANELBOARDS.—This line continues strong, the volume of business being satisfactory. Deliveries are coming in from two to three weeks.

SEATTLE

The feature of the past week's business was the placing of a large order for power apparatus in the Portland territory and the continued movement of floodlamps and sewing machines. During the past month several large orders for power apparatus in the Portland and Gray's Harbor fields have been placed by shipyards, but the last order was considerably heavier than the preceding ones. The buying of electrical apparatus and equipment in the Puget Sound district continues with steady volume. Last week showed a noticeable increase in government buying for navy yard and cantonment work.

A recent order was placed for floodlamps for both the navy yard and the American Lake cantonment, also for a considerable amount of house-wiring material and matter listed as pick-ups. An inquiry was received in Seattle for 400 washing machines for the Montana territory. Washing-machine and other domestic appliance sales are keeping up well. Irons and ranges are expected to begin a sharper movement with the approaching summer. The conduit situation is again causing much concern. Recent shipments, consisting of several carloads, relieved the situation temporarily, but the available supply is practically exhausted. Eastern manufacturers cannot obtain closed cars to make shipments. The shortage of rubber-covered wire in the larger sizes, of porcelain, of the larger motors and of certain sizes of lamps has not been relieved to any extent. Prices remain practically the same. Several large credits are in the process of being placed in the Seattle territory for shipbuilding enterprises. Collections are excellent. A Seattle shipyard recently signed a contract for constructing six submarines for the United States government. By-products factories of various kinds are in prospect for immediate establishment in Seattle and contiguous territory. Electrical jobbers are in receipt of inquiries for electrical equipment for several wood by-products plants, including corks, lignum, cellulose, wood alcohol, wood flour, fir oil, etc.

Dealers report that sales of house-wiring devices are well sustained, and fixture sales show a noticeable increase over the past two weeks. Jobbing and factory propositions are receiving favorable consideration in the Spokane field, and it is believed that Spokane is on the eve of an important industrial expansion. The total of elevators already up, contracted for or under construction in the Northwest—Washington, Oregon and Idaho—is placed at 200 to date.

Douglas fir lumber is specified by the government for the frame superstructures of 100,000 new freight cars. Car builders of the Northwest are trying to land a portion of the car-building contract. Shops in Portland, Seattle and Tacoma assert they are equipped to handle 10,000 cars within a specified time. The car supply at the West Coast mills is slightly improved, although a permanent improvement will not result until it substantially exceeds the volume of production at the mills. Railroad and steamship companies are slowly reducing the amount of accumulated export freight in Seattle's yards and docks. Freight conditions are deplorable, with no immediate signs of improvement.

SAN FRANCISCO

The past week has been a quiet one for the electrical industry, and this condition will doubtless continue during the course of the Liberty loan drive. In deference to this campaign, the National Electric Light Association convention at Del Monte, which was to be held in April, has been postponed to the second week in May so as not to interfere with the patriotic efforts of the delegates.

There is little new building reported, the outstanding features being the awarding of contracts by the Pacific Gas & Electric Company for the extension of its transmission lines to Guinda, Rumsey and Brooks and by the Pacific Telephone & Telegraph Company for a six-story class A building in Oakland and several street railway extensions in San Francisco. The scanty snowfall of last winter is reflected by the construction of a third reservoir on the Stanislaus River by the Sierra & San Francisco Power Company and a planned interchange of power between the San Joaquin Light & Power Corporation and the Mount Whitney system, which have tied their power transmission lines together at Strathmore. San Francisco building permits for March, 1918, totaled 380, costing $758,000, as against the respective figures of 597 and $2,040,000 for March, 1917.

No general statement can be made that will adequately cover credit conditions, for they vary with different classes of customers. They can be approximated by the assertion that collections from dealers and contractors are surprisingly good, but that payments on work and material for industrial plants are quite slow. In the opinion of shrewd credit men the reasons for this state of affairs are plain—first, that electrical dealers are no longer inclined to recklessly take work without regard to the credit risk; second, that on account of widespread industrial work retail money is plentiful and payments are prompt to dealers; third, that a great deal of this industrial work is for the government, whose routine for payment takes time and slows up successive payments; fourth, that there seems to have been a wave of slower conditions that was first noted in New York two months ago and has gradually spread West.

Staple material is found to be ready for factory shipment in a far shorter time than during the first two months of the year, although it is almost impossible to get special material. The strenuous efforts of the various car conservation committees have resulted favorably, but the time in transit is still unimproved, forty-five days for carloads and from fifty to sixty days for less-than-carload shipments being the average.

LAMPS.—Deliveries are better and business still holds strong. The customary summer let-up will be welcome this year, as it will enable dealers to catch up on their back orders, and the 10 per cent increase in the price of lamps will more than care for any lessened consumption due to the new daylight law.

MOTORS.—Stocks are good and deliveries fair, with a steady demand for 2-hp. to 5-hp. sizes and an increased call for 20-hp. to 50-hp. sizes, some of which is due to the opening of new mines.

Current Prices of Electrical Supplies

New York and Chicago Quotations

THE prices quoted are those prevailing in standard packages of specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of this week. They are in all cases the net prices or prices subject to discounts from standard lists of contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges on account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit. Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East and Middle West, their nearness to the sources of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers. Price variations may be due to difference in grade of products of different manufacturers, to local conditions, or to both.

ARMORED CONDUCTORS, FLEXIBLE STEEL

Single-Conductor

B. & S. Size	List per 1000 Ft.
No. 14 solid	$61.00
No. 12 solid	71.00
No. 10 solid	90.00
No. 8 solid	106.00
No. 6 solid	145.00
No. 10 stranded	95.00
No. 8 stranded	115.00
No. 6 stranded	160.00
No. 4 stranded	205.00
No. 2 stranded	266.00
No. 1 stranded	315.00

Twin-Conductor

No. 14 solid	104.00
No. 12 solid	135.00
No. 10 solid	185.00
No. 8 stranded	235.00
No. 6 stranded	370.00
No. 4 stranded	575.00

NET PRICE AND DISCOUNT PER 1000 FT.—NEW YORK

Single-Conductor

	No. 14 Solid
Less than coil	List to $61.00
Coil to 1000 ft	10% to 57.25
	No. 12 Solid
Less than coil	List to $71.00
Coil to 1000 ft	10% to 66.75

Twin-Conductor

	No. 14 Solid
Less than coil	List to $104.00
Coil to 1000 ft	$97.75 to 10%
	No. 12 Solid
Less than coil	List to $135
Coil to 1000 ft	10% to $126.80

DISCOUNT—CHICAGO

Single-Conductor

	No. 14 Solid
Less than coil	15% to + 10%
Coil to 1000 ft	5% to 20%
	No. 12 Solid
Less than coil	15% to + 10%
Coil to 1000 ft	5% to 20%

Twin-Conductor

	No. 14 Solid
Less than coil	15% to 10%
Coil to 1000 ft	20%
	No. 12 Solid
Less than coil	15% to + 10%
Coil to 1000 ft	10% to 20%

ATTACHMENT PLUGS

List ranges from $0.22 to $0.30 each
Standard packages from 100 to 250.

DISCOUNT—NEW YORK

Less than 1/5 std pkg	10% to $24.00
1/5 to std. pkg	20% to 19.80
Std. pkg.	34% to 18.75

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	+20% to 12%
1/5 to std. pkg	20% to List
Std. pkg.	28% to 44%

BATTERIES, DRY

NEW YORK

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.40	$0.40
12 to 50	.35	.35
50 to barrel	.31	.32
Barrel lots	.28 to .285	.29 to .295

CHICAGO

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.40	$0.40
12 to 50	.35	.35
50 to barrel	.3175-.3195	.3275-.3295
Barrel lots	.2875-.2895	.2975-.2995

CONDUIT, METALLIC FLEXIBLE

Size, In.	Ft. per Coil	List, per 100 Ft.
5/16	250	$5.00
3/8	250	7.50
1/2	100	10.00
3/4	50	13.00
1	50	21.00
1 1/4	50	26.00
1 1/2	25–50	35.00
2	25–50	45.00
2 1/2	25–50	52.00

NET PER 100 FT.—NEW YORK

	Less Than Coil	Coil to 1000 Ft.
3/8-in. s. stp.	Net to $75.00	—15% to $69.75
3/8-in. d. stp.	+10% to 75.00	List to 72.00
1/2-in. s. stp.	List to 100.00	—15% to 93.00
1/2-in. d. stp.	+10% to 100.00	List to 96.00

NET PER 1000 FT.—CHICAGO

	Less Than Coil	Coil to 1000 Ft.
3/8-in. single strip	$75.00	$63.75
3/8-in. double strip	78.25-78.75	71.25-71.75
1/2-in. single strip	100.00	85.00
1/2-in. double strip	105.00	95.00

CONDUIT, NON-METALLIC FLEXIBLE

Size, In.	List per Foot	Size, In.	List per Foot
7/32	$0.05 1/2	1	$0.25
1/4	.06	1 1/4	.33
3/8	.09	1 1/2	.40
1/2	.12	1 3/4	.47
5/8	.15	2	.55
3/4	.18	2 1/4	.65

NET PER 1000 FT.—NEW YORK

Less Than $15 List	$15 to $60 List	$60 to $150 List
7/32-in.—		
$25.00-$55.00	$20.50-$24.50	$20.00-$21.50
1/4-in.—		
$28.00-$60.00	$22.50-$27.00	$22.00-$23.50

NET PER 1000 FT.—CHICAGO

Less Than $15 List	$15 to $60 List	$60 to $150 List
7/32-in.—		
$36.00-$55.00	$25.00	$22.50
1/4-in.—		
$40.00-$66.00	$27.00	$25.00

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON

Card No. 38

Size, In.	Conduit, List per Foot
1/4	$0.08 1/2
3/8	.08 1/2
1/2	.08 1/2
3/4	.11 1/2
1	.17
1 1/4	.23
1 1/2	.27 1/2
2	.37 1/2
2 1/2	.58 1/2
3	.76 1/2

	Couplings, List	Elbows, List
1/4	$0.05	$0.19
3/8	.06	.19
1/2	.07	.19
3/4	.10	.25
1	.13	.37
1 1/4	.17	.45
1 1/2	.21	.50
2	.28	1.10
2 1/2	.40	1.80
3	.60	4.80

DISCOUNT—NEW YORK

	1/4 in. to 1/2 in.	3/4 in. to 3 in.
Less than 2500 lb.	4% to 12%	7% to 15%
2500 to 5000 lb.	6% to 14%	9% to 17%

(For galvanized deduct six points from above discounts.)

DISCOUNT—CHICAGO

	1/4 in. to 1/2 in.	3/4 in. to 3 in.
Less than 2500 lb.	5.3% to 8.9%	8.3% to 10.9%
2500-5000 lb.	7.3% to 10.9%	10.3% to 13.9%

(For galvanized deduct six points from above discounts.)

FLATIRONS

NEW YORK

List price	$5.00 to $6.00
Discount	30%

CHICAGO

List	$5.00 to $6.00
Discount	25% to 30%

FUSES, INCLOSED

250-Volt	Std. Pkg.	List
3-amp. to 30-amp.	100	$0.25
35-amp. to 60-amp.	100	.35
65-amp. to 100-amp.	50	.90
110-amp. to 200-amp.	25	2.00
225-amp. to 400-amp.	25	3.60
450-amp. to 600-amp.	10	5.50
600-Volt		
3-amp. to 30-amp.	100	$0.40
35-amp. to 60-amp.	100	.60
65-amp. to 100-amp.	50	1.50
110-amp. to 200-amp.	25	2.50
225-amp. to 400-amp.	25	5.50
450-amp. to 600-amp.	10	8.00

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	20% to 30%
1/5 to std. pkg.	38% to 40%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	28% to 30%
1/5 to std. pkg.	38% to 40%

FUSE PLUGS

3-Amp. to 30-Amp.

NEW YORK

	Per 100 Net
Less than 1/5 std. pkg.	$5.00
1/5 to std. pkg.	4.50

Standard packages, 500. List, each, $0.07.

CHICAGO

	Per 100 Net
Less than 1/5 std. pkg.	$6.25
1/5 to std. pkg.	5.25

Standard packages, 500. List, each, $0.07.

LAMPS, MAZDA

105 to 125 Volts

Regular, clear:	Std. Pkg.	List, Each
10 to 40-watt—B	100	$0.30
60-watt—B	100	.35
100-watt—B	24	.70
75-watt—C	50	.70
100-watt—C	24	1.10
200-watt—C	24	2.20
300-watt—C	24	3.25
Round bulbs, 3⅛ in., frosted:		
15-watt—G 25	50	.53
25-watt—G 25	50	.55
40-watt—G 25	50	.55
Round bulbs, 3¾ in., frosted:		
60-watt—G 30	24	.77
Round bulbs, 4⅝ in., frosted:		
100-watt—G 35	24	1.10

DISCOUNT—NEW YORK

Less than std. pkg.	Net
Std. pkg.	10%

DISCOUNT—CHICAGO

Less than std. pkg.	Net
Std. pkg.	10%

LAMP CORD

Cotton Covered, Type C, No. 18

NEW YORK

	Per 1000 Ft. Net
Less than coil (250 ft.)	$31.00 to $34.90
Coil to 1000 ft.	26.20 to 27.90

CHICAGO

	Per 1000 Ft. Net
Less than coil (250 ft.)	$29.00 to $30.00
Coil to 1000 ft.	21.50 to 22.30

LAMP GUARDS, WIRE

Standard packages from 50 to 150

NEW YORK

Net per 100	$24.00

CHICAGO

Net per 100	$21.75

OUTLET BOXES

Nos.	List, per 100
101—A, A1½, 4 S.C., 6200, 320	$30.00
102—B.A., 6200, S.E., 300, AX, 1½ 4 S.	30.00
103—C.A., 9, 4R, B 1½	25.00
106—F.A., 7, C.S., 1½, 3 R.	20.00

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $10.00 list	25%	20%
$10.00 to $50.00 list	42%	37%

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $10.00 list	40%	35%
$10.00 to $50.00 list	50%	45%

PIPE FITTINGS

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

PORCELAIN CLEATS—UNGLAZED

2 and 3 Wire

NEW YORK

	Per 1000 Net
Less than 1/5 std. pkg.	$20.00 to $38.00
1/5 to std. pkg.	19.00 to 20.00

Standard package, 2200. List per 1000, $20.

CHICAGO

	Per 1000 Net
Less than 1/5 std. pkg.	$15.80
1/5 to std. pkg.	14.80

Standard package, 2200. List per 1000, $20.

PORCELAIN KNOBS

NEW YORK

Per 1000 Net	Std. Pkg. 3500 5½ N.C.	Std. Pkg. 4000 Solid Nail-it—N.C.
Less than 1/5 std. pkg.	$27.50 to $29.00	$30.75
1/5 to std. pkg.	15.60 to 20.75	24.20

CHICAGO

Per 1000 Net	Std. Pkg. 3500 5½ N. C.	Std. Pkg. 4000 Solid Nail-it—N.C.
Less than 1/5 std. pkg.	$11.85	$30.75
1/5 to std. pkg.	11.10 to $11.40	24.20

SOCKETS AND RECEPTACLES

	Std. Pkg.	List
⅛-in. cap key and push sockets.	500	$0.33
⅛-in. cap keyless socket	500	.30
⅛-in. cap pull socket	250	.60

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	Net to $23.00
1/5 to std. pkg.	15% to 20%

NET PER 100—CHICAGO

Less than 1/5 std. pkg.	24% to 25%
1/5 std. pkg.	30% to 33%

SWITCHES, KNIFE

250-Volt, Front Connections, No Fuse

High Grade:	
30-amp. S. P. S. T.	$0.80
60-amp. S. P. S. T.	1.20
100-amp. S. P. S. T.	2.25
200-amp. S. P. S. T.	3.48
300-amp. S. P. S. T.	5.34
30-amp. D. P. S. T.	1.20
60-amp. D. P. S. T.	1.78
100-amp. D. P. S. T.	3.38
200-amp. D. P. S. T.	5.20
300-amp. D. P. S. T.	8.00
30-amp. 3 P. S. T.	1.80
60-amp. 3 P. S. T.	2.68
100-amp. 3 P. S. T.	5.08
200-amp. 3 P. S. T.	7.80
300-amp. 3 P. S. T.	12.00
Low Grade:	
30-amp. S. P. S. T.	0.42
60-amp. S. P. S. T.	0.74
100-amp. S. P. S. T.	1.50
200-amp. S. P. S. T.	2.70
30-amp. D. P. S. T.	0.68
60-amp. D. P. S. T.	1.22
100 amp. D. P. S. T.	2.50
200-amp. D. P. S. T.	4.50
30-amp. 3 P. S. T.	1.02
60-amp. 3 P. S. T.	1.84
100-amp. 3 P. S. T.	3.76
200-amp. 3 P. S. T.	6.76

DISCOUNT—NEW YORK

	High Grade
Less than $10 list	List to + 5%
$10 to $25 list	11%
$25 to $50 net	14% to 15%
	Low Grade
Less than $10 list	5% to 10%
$10 to $25 list	16%
$25 to $50 list	24% to 25%

DISCOUNT—CHICAGO

	High Grade
Less than $10 list	+5%
$10 to $25 list	10% to 11%
$25 to $50 list	14%
	Low Grade
Less than $10 list	+5%
$10 to $25 list	16%
$25 to $50 list	24%

SWITCHES, SNAP AND FLUSH

5-Amp. and 10-Amp., 125-Volt Snap Switches

	Std. Pkg.	List
5-amp. single-pole	250	$0.28
5-amp, single-pole, ind.	250	.32
10-amp. single-pole	100	.48
10-amp. single-pole, ind.	100	.54
5-amp. three-point	100	.54
10-amp. three-point	50	.76
10-amp., 250-volt, D. P.	100	.66

SWITCHES, SNAP AND FLUSH—Cont'd

10-Amp., 250-Volt Push-Button Switches

	Std. Pkg.	List
10-amp. single-pole	100	$0.45
10-amp. three-way	50	.70
10-amp. double-pole	50	.70

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	List
1/5 to std. pkg.	15%
Std. pkg	28%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	+20% to list
1/5 to std. pkg.	List to —15%
Std. pkg.	30%

SWITCH BOXES, SECTIONAL CONDUIT

Union and Similar—	List Each
No. 155	$0.34
No. 160	.60

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $2.00 list	List 40%	Net to 30%
$2.00 to $10.00 list	10% to 50%	5% to 40%
$10.00 to $50.00 list	20% to 64%	15% to 52%

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $2.00 list	25%	20%
$2.00 to $10.00 list	25%	20%
$10.00 to $50.00 list	25%	20%

TOASTERS, UPRIGHT

NEW YORK

List price	$6.00
Discount	30%

CHICAGO

List price	$5.00 to $6.00
Discount	25% to 30%

WIRE, ANNUNCIATOR

NET PRICE—NEW YORK

	Per Lb. Net
No. 18, less than full spools.	$0.41¼-$0.44¼
No. 18, full spools	0.36¼- 0.43¼

CHICAGO

	Per Lb. Net
No. 18, less than full spools.	$0.57½ to $0.65
No. 18, full spools	0.50½ to 0.55

WIRE, RUBBER-COVERED, N. C.

Solid-Conductor, Single-Braid

NEW YORK

	Price per 1000 Ft. Net—		
No.	Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
11..	$15.00-$18.00	$12.50-$13.00	$9.85-$11.50
12..	23-25- 25.40	21.30- 21.80	15.95- 19.35
10..	32.40- 35.20	29.70- 30.20	22.10- 27.00
8..	45.70- 49.15	41.90- 42.10	30.88- 38.00
6..	72.40- 77.85	66.35- 66.75	48.95- 60.30

CHICAGO

	Price per 1000 Ft. Net—		
No.	Less than 500 Ft.	500 to 2500 Ft.	2500 to 5000 Ft.
14..	$18.00	$13.00	$11.50
12..	25.33-$26.28	22.02-$25.33	18.35-$20.93
10..	30.49- 36.54	27.94- 31.26	22.86- 29.23
8..	42.54- 51.57	38.99- 44.13	31.90- 41.36
6..	66.46- 88.38	56.15- 75.61	50.53- 70.70

WIRE, WEATHERPROOF

Solid-Conductor, Triple-Braid, Size 4/0 to 8 Inc.

NEW YORK

	Per 100 Lb. Net
Less than 25 lb.	$33.25 to $35.25
25 to 50 lb.	31.25 ...
50 to 100 lb.	28.25 to 34.25

CHICAGO

	Per 100 Lb. Net
Less than 25 lb.	$35.42 to $40.00
25 to 50 lb.	34.42 to 39.00
50 to 100 lb.	33.42 to 38.35

NEW APPARATUS & APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Weldless Guy-Rod Head

The Diamond Expansion Bolt Company, 90 West Street, New York City, has developed a new guy-rod head shown in the accompanying illustration. It consists of a weldless loop constructed so that a square-headed rod can be slipped through it and held in position against turning. The weldless

GUY-ROD HEAD ALLOWS NATURAL BEND FOR WIRE

eye is shaped so that the wire looped through it will not be bent in too small radius. Another advantage lies in the fact that there are no screw threads above the ground level to deteriorate from atmospheric conditions.

Portable Commutator Slotting Machine

A new and simple slotting machine for undercutting mica in commutators is being manufactured by F. E. Aurand of 123 South Cuyler Avenue, Oak Park, Ill. The machine consists essentially of a head which contains a small circular saw attached to a transverse shaft carrying a worm gear, and a hollow handle which contains the worm shaft and a small motor. The service wires for the motor enter through the outer end of the handle.

The device can be used for all sizes of commutators and can be adjusted to cut at various depths. A thin guide shoe slides in the slot immediately behind the cutting saw and greatly aids in holding the saw in its proper plane.

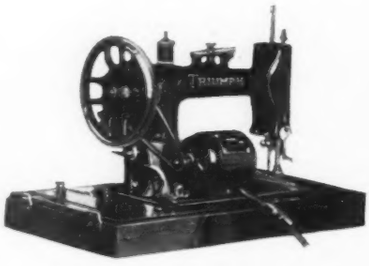
MACHINE SLOTS COMMUTATORS WITHOUT REMOVING BRUSH RIGGING

One of the principal advantages lies in the fact that most commutators can be undercut with this device without removing the brush-holder rigging. On small machines it may be necessary to remove one set of brushes, but on most large machines no dismantling is necessary. By using care in the selection of properly gaged saws the manufacturer claims that mica can be cut as clean as by a milling machine.

The small motor contained in the handle is of the universal type. Machines which will be operated by means of a flexible shaft instead of the motor will be built if customers desire. The hollow handle is made of cast aluminum and the complete outfit weighs about 11 lb. (5 kg.). Its simplicity and the ease with which inexperienced mechanics readily learn to operate it are among the features claimed for the device.

Portable Electric Sewing Machine

A light, compact sewing machine has been placed upon the market by the Triumph Specialty Company, 235 Canal



ENTIRE OUTFIT CAN BE EASILY CARRIED

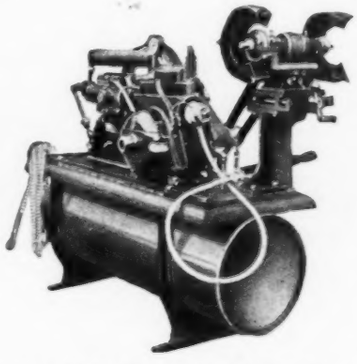
Street, New York City. The device consists of a sewing-machine head, a motor, a speed regulator and a cover. The whole outfit can be packed inside the cover, and is so light that it can be easily carried and placed out of the way when not in use. Power is supplied by a Westinghouse "sew-motor" designed for 115-volt direct-current and 110-volt alternating-current circuits. The machine and motor are directly connected by a belt, which, it is claimed, insures quiet operation. The motor is controlled by a foot-operated speed regulator which provides any speed from one to several hundred stitches per minute. It is made of heavy steel and well insulated, being connected to the motor by a reinforced flexible cable.

Small-Size Warming Pad

The Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa., has placed on the market a 9-in. by 12-in. (22.8-cm. by 30.5-cm.) warming pad. The pad is similar to the standard 12-in. by 15-in. (30.5-cm. by 38.1-cm.) pad manufactured by the same company. It is equipped with two thermostats which are inclosed in the pad. These thermostats are connected in series and prevent overheating by opening the circuit when the temperature rises to a point near the maximum safe value. When the temperature falls the thermostat will reclose the circuit and thus maintain the heat at a uniform temperature. The pad is manufactured in one style only for a voltage range of 95 volts to 125 volts, and the power demand is 48 watts at 110 volts.

Combined Air Compressor, Buffing and Grinding Head

The United States Air Compressor Company, Cleveland, Ohio, has placed upon the market a combination air compressor and grinder outfit which is especially suitable for service in garages and similar places where compressed air is required. The outfit, driven by a 1-hp. Robbins & Myers motor, consists of a self-oiling air compressor with filtering trough, safety valve, buffing head and pressure tank with accessories. The air compressor is air-cooled and is designed for pressures up to 300 lb. per sq. in. (21 kg. per sq. cm.). An extra tank is provided to allow the motor to start against no pressure and obtain momentum before any load is applied. When the air in the main tank is raised to the proper pressure the automatic switch stops the motor and operates an automatic pressure release which



AUXILIARY TANK ALLOWS MOTOR TO GAIN SPEED BEFORE ASSUMING LOAD

opens the tank to the air. The rating of the motor is sufficient to allow the use of the buffing and grinding outfit at the same time the air compressor is working.

Concealed-Terminal, Fuseless Cleat Rosette

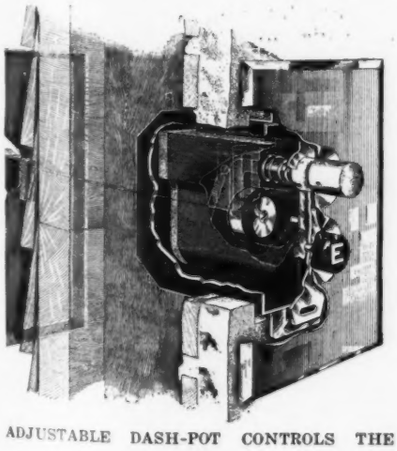
Pass & Seymour, Inc., Solvay, N. Y., have placed upon the market a concealed-terminal, fuseless-cleat rosette with a pivot cap. The rosette is of special rugged construction and is designed to carry the wires a full half inch (1.27 cm.) from the surface wired over. The binding screws which secure the cap to the base are so arranged that the cap may be pivoted on one end while the other end of the cap, when the binding screws are released, swings in or out of position. This feature makes it easy to wire the rosette at a bench or on a step-ladder.

Electric Iron with Switch Plug

Landers, Frary & Clark of New Britain, Conn., are marketing two 8-lb. (2.7-kg.) electric iron models equipped with permanently attached push-button switches. These switches are conveniently arranged on the iron so that they can be controlled without moving the hands from the iron handle. A quick double-break switch of simple construction is inclosed in a heavy split casing held together by a steel clamp which also serves to attach the plug to the handle bracket. It is claimed that the use of this switch lengthens the life of the cord, saves energy, and is advantageous because of the fact that it eliminates the arc which would ordinarily occur when the commonly used plug is removed from the iron.

Push-Button Switch with Automatic Time Regulation

The accompanying illustration shows a switch that can be closed by direct or remote control and will stay closed for

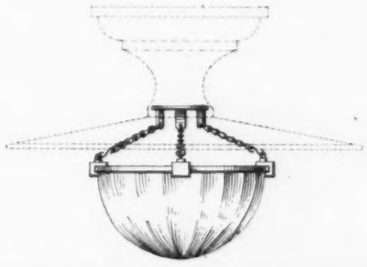


ADJUSTABLE DASH-POT CONTROLS THE TIME

a predetermined time. The connecting operation is accomplished by pressing the button at the top of the switch or by working a device on the opposite side of the room that is connected to this button by means of a steel wire. An adjustable dash-pot limits the time during which the circuit remains closed. This time limit can be varied from a few seconds to a ten-minute interval. If it is desired to close the switch for an indefinite period the black button marked *E* is pressed upward. To open the circuit the same button is pressed down. The device is useful for installations of porch and basement lamps, and in many halls and garages. It is claimed that the device is economical because its action is positive and there is no chance of the lamp burning unintentionally after the predetermined period. It is being marketed by Samuel M. Esler, 59 East Adams Street, Chicago.

Adapter for Changing from Direct to Indirect Lighting

The accompanying diagram shows a method of adapting diffusing bowls to old lighting fixtures having standard fittings. The adapter makes it possible to use the flat-type doric moonstone or other direct-lighting reflector styles of shades with gas-filled lamps for indirect lighting. This adapter consists merely of three chains with spring clips at the lower end and a shade fitting at the

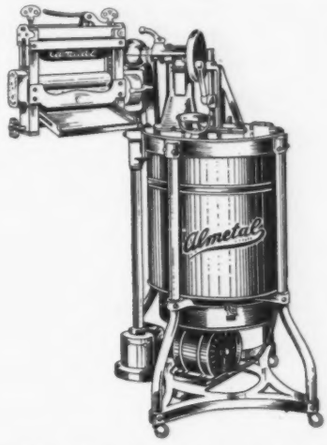


SPRING CLIPS THAT ARE EASILY REMOVED FROM BOWL FOR CLEANING

upper end. The upper end is attached to the shade holder of the original unit and the lower spring clips are attached to the diffusing bowl. The spring clips can be easily attached to the bowl but cannot slip off accidentally. By using these adapters an even pull is exerted on the diffusing-bowl rim and the bowl does not have to be bored and thus weakened. This device is manufactured by the Lighting Studios Company, 220 West Forty-second Street, New York City.

Household Steam Laundry with Facilities for Inspection

The accompanying illustration shows a motor-operated "Almetal" household steam laundry marketed by the Manufacturers' Distributing Company, Fullerton Building, St. Louis, Mo. The machine, which is gas-heated, boils, washes and sterilizes fabrics in one operation by the vacuum-suction system. It forces boiling soapsuds through the clothes, heats the water in the machine, and keeps it boiling until the washing operations are finished. Inspection of the clothes in this machine is facilitated by a device that automatically lifts the clothes out of the hot water. If they are found to be clean they can then be



CLOTHES AUTOMATICALLY LIFTED OUT OF WATER

run directly through the wringer. The washing machine is of metal construction throughout and is operated by a 0.25-hp. Robbins & Myers waterproof motor.

Gothic Lantern

The National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, has placed on the market a new Gothic lantern that is adapted for use in a building decorated in Gothic style. The fixture is made of "compone" in a variety of finishes with either opal or colored glass panels. The lantern can be used for luminous indirect, indirect or direct lighting, and is especially desirable for use in churches, clubs or public buildings.

Expansion Joint for Pipe Line

A device that, it is claimed, eliminates pipe-line expansion difficulties is being placed upon the market by the R. D. Nuttall Company of Pittsburgh, Pa. The expansion joint is made of one piece of material, machined inside and out from a solid forged-steel blank which is oil-tempered. The corrugations allow expansion or contraction by an action similar to that of bellows. The one-piece joints are made in all sizes with standard flanges for either high-pressure or low-pressure pipe lines. The high-pressure joints are designed to allow an expansion and contraction of 1 in. (2.5 cm.) from normal, or a total movement of 2 in. (5 cm.). The low-pressure joints allow 0.31 in. (0.8 cm.) movement over or under normal, or a total movement of 0.63 in. (1.6 cm.). Limiting bolts are provided as shown to prevent expansion beyond the safe limit, and a sliding sleeve is also inserted in the high-pressure joints to minimize friction and help support the internal pressure strain.

Trade Notes

THE H. W. JOHNS-MANVILLE COMPANY'S Youngstown (Ohio) office is now at 520 Market Street.

THE YARNALL-WARING COMPANY of Philadelphia has decided to group its several products under the name of "Yarway."

THE HOMESTEAD VALVE MANUFACTURING COMPANY of Homestead, Pa., has opened a branch office at 1 Franklin Street, New York City.

THE CLEMENS ELECTRICAL CORPORATION, 725 Main Street, Buffalo, N. Y., has appointed the Doherty-Hafner Company, 618-626 West Jackson Boulevard, Chicago, its agent.

ROBERT S. BLAKE, formerly employed by the Conduit Electric Manufacturing Company of Boston, Mass., in charge of the Philadelphia office, has been made district manager in the Chicago territory for the Duquesne Electric & Manufacturing Company. Mr. Blake has headquarters at 230 South La Salle Street, Chicago.

THE HOTPOINT DIVISION OF THE EDISON ELECTRIC APPLIANCE COMPANY, INC., of Chicago, New York and Ontario, Cal., has formulated extensive publicity plans to increase the use of electrical appliances. The Hotpoint distributers have been sent a complete outline of promotion plans for the first half of 1918.

A. D. ALEXANDER has purchased the Pittsburgh office of the Richard D. Kimball Company, consulting engineer, and will continue the business under his own name. Mr. Alexander has been resident engineer in charge of the Pittsburgh office of the above concern for the past three years and was formerly engineer with the Pittsburgh Board of Public Education.

THE NAVY DEPARTMENT, Bureau of Supplies and Accounts, division of inland traffic, has issued. under date of March 21, a set of instructions to navy contractors concerning car supply and expeditious trade movement—carload and less than carload. A copy of these instructions can be had from H. P. Anewald, manager inland traffic, Navy Department, Washington, D. C.

MacGOVERN & COMPANY of New York City, well-known dealers in second-hand equipment, announce the opening of branch offices at Pittsburgh, Pa., and St. Louis, Mo. The office in Pittsburgh is at 498 Union Arcade and is under the direction of L. H. Tippins and W. L. Sprengle. The St. Louis office is at 315 North Twelfth Street and is under the direction of R. S. Fisher, district manager.

WILLIAM C. MAGELSSEN, United States Consul, advises the Bureau of Foreign and Domestic Commerce that Melbourne, Australia, has a movement now on foot to secure the standardization of all electrical goods. When standards have been adopted the schedules will be made available by the Commonwealth Bureau of Science and Industry, and copies will be very serviceable to American manufacturers intending to compete in this trade.

THE SPRAGUE ELECTRIC WORKS OF THE GENERAL ELECTRIC COMPANY are now in the new building in Bloomfield, N. J., which provides increased capacity for the manufacture of generators, motors and controllers, dynamometers, hoists, ozonators and electric fans. It is of reinforced concrete, 75 ft. by 550 ft., with an L 75 ft. by 175 ft., six stories in height, walls and columns being designed for the addition of another story should it be necessary at some future time.

W. H. HOLCOMB has joined the sales forces of the Moloney Electric Company and will be connected with the home office in St. Louis. Formerly Mr. Holcomb was sales engineer for the Frank Adam Electric Company of St. Louis, and later he was with the Allis-Chalmers Company of Milwaukee. More recently he had returned again to the employ of the Frank Adam Electric Company and had been opening branch offices for that concern at Detroit, Cincinnati, Minneapolis and Washington, D. C.

THE IRVINGTON (N. J.) VARNISH & INSULATOR COMPANY has made plans for giving free to each employee who has been drafted or who has enlisted a life insurance policy for $2,500, the premiums to be paid by the company during the period of the war. There are at present about 460 employees who will benefit by this action. If other employees are drafted or enlist, they will automatically come within the provisions of this gift. This was done by the company in its desire to make sure that any dependents of its soldier employees should not be left destitute in any circumstances.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY has just announced that, as of April 1, 1918, the Copeman Electric Stove Company will be merged in a new company to be known as the Westinghouse Electric Products Company, with headquarters and factory at Mansfield, Ohio. This factory will be devoted to the manufacture of heating appliances previously made at the Newark works of the Electric Company and the Flint (Mich.) works of the Copeman Electric Stove Company. The general operations of the Westinghouse Electric Products Company will be directed by W. K. Dunlap as general manager. Mr. Dunlap is also assistant to vice-president of the Westinghouse Electric & Manufacturing Company.

THE WAR TRADE BOARD, Washington, D. C., under date of March 28, addresses the following notice to exporters and importers: "It has come to the attention of the War Trade Board that various individuals, firms and corporations have been advertising their services to be rendered in the matter of securing export and import licenses. The War Trade Board suggests that it is not necessary for exporters and importers to consult such agencies. The various bureaus of the War Trade Board will supply all the information desired on receipt of requests therefor. The board desires to place as little inconvenience and expense upon importers and exporters as possible, and therefore this suggestion is made in order that they may not be put to the expense of employing such agencies to obtain licenses unless they so desire."

Trade Publications

PUMPS.—The Manistee Iron Works Company, Manistee, Mich., has issued a catalog entitled "The Pump That 'Manistee' Builds." An exploded view brings out the features of the pump construction. Data on operating characteristics are given.

DISCONNECTING HANGERS. — "Do Your Reflectors Reflect?" is the title of a circular being circulated by the Thompson Electric Company, 5606 Euclid Avenue, Cleveland, which illustrates the principle of the Thompson "safety" disconnecting hangers. These hangers allow the reflectors to be cleaned easily.

LAVA INSULATORS. — The Tennessee Burner Manufacturing Company of Chattanooga, Tenn., has issued a circular entitled "After Your Patronage," describing its lava insulators for high-frequency circuits. These insulators are designed to withstand a temperature of more than 2000 deg. C. and are made in any shape or form.

HYDROELECTRIC TURBINES. — The Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has issued a circular illustrating the most powerful high-head turbine in the world. The turbine, which is used by the Puget Sound Traction, Light & Power Company, is rated at 25,000 hp. and rotates at 360 r.p.m. against a 440-ft. (134-m.) head.

INDUSTRIAL POWER-PLANT CONSTRUCTION.—The Guarantee Construction Company, 140 Cedar Street, New York, is distributing bulletin No. 122, entitled "Economic Handling and Storage of Coal, Ashes and Other Material." The bulletin is well illustrated and shows actual installations that the company has designed and constructed. A description of the Darley suction conveyor is given and its advantages are pointed out.

STEAM TABLES FOR CONDENSER WORK.—The Wheeler Condenser & Engineering Company, Carteret, N. J., has issued the fourth edition of a bulletin entitled "Steam Tables for Condenser Work," which is a handbook of steam tables with pressures below atmosphere expressed in inches of mercury referred to a 30-in. (76-mm.) barometer. It also includes discussions on the use of the mercury column and the accuracy of such measurements.

INDUSTRIAL TRUCKS CHARGING OUTFIT.—A folder has just been issued by the Cutler-Hammer Manufacturing Company of Milwaukee, illustrating and describing the "C-H" sectional battery-charging equipment for industrial electric trucks. A type of battery-charging outfit is referred to which is especially suitable for public and private garages. This charging equipment is provided in sections, each of which is a complete charging unit so that new sections can be added with the purchase of additional trucks.

SILK TAPE.—The Mitchell-Rand Manufacturing Company, 99 John Street, New York, is distributing a card price list of its plain silk insulating tapes. A sample of silk tape is attached to the card and prompt delivery is assured.

BOILER METERS.—"How to Save Coal" is the title of a circular being distributed by the Bailey Meter Company of 141 Milk Street, Boston. The bulletin shows the things that must be considered in the boiler room to obtain efficient operation.

ELECTRICAL EQUIPMENT IN THE WOODWORKING INDUSTRY. — This is the title of circular 7133, being distributed by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. The bulletin describes the applications of electric drive in woodworking industry and shows actual installations. Motors and their controllers are very clearly described in the bulletin. In the back of the booklet is a table giving the power requirements of woodworking machinery. Practically every machine used in the woodworking industry is listed in the table.

New Incorporations

THE MEASURED SERVICE METER COMPANY of Uniontown, Pa., has been incorporated by R. A. Neville and others. The company is capitalized at $50,000 and will make telephone and other meters.

THE CEILITE COMPANY of Utica, N. Y., has been incorporated with a capital stock of $100,000 by W. L. Foley, W. I. Taber and S. Garfunkel of Utica. The company proposes to manufacture gas and electric fixtures.

THE ELECTRIC ZINC RUST PROOF COMPANY of Detroit, Mich., has been chartered with a capital stock of $10,000 to deal in solution and electroplating equipment. The incorporators are: Alfred T. Warner, Charles G. Bennett, Thompson W. Kirby.

THE HOME LIGHTING & STORAGE BATTERY COMPANY of Newcastle, Ind., has been incorporated by Samuel N. Denton, Luther O. Draper and Isaac E. Hays. The company is capitalized at $25,000 and proposes to manufacture storage batteries.

THE LIBERTY LIGHTING SUPPLY COMPANY of New York, N. Y., has been incorporated by M. P. Hartman, A. Weiss and H. Hoffman, 2270 Seventh Avenue, New York. The company is capitalized at $5,000 and proposes to manufacture lighting fixtures.

THE AMERICAN ELECTRIC PRODUCTS COMPANY of Montreal, Que., has been incorporated by L. Macfariane, W. B. Scott, J. McNaughton and others. The company is capitalized at $1,500,000 and proposes to manufacture electrical equipment, machinery, etc.

THE CELL BEAM CORPORATION of New York, N. Y., has been incorporated with a capital stock of $5,000 to manufacture and deal in lighting fixtures. The incorporators are: J. Record, R. W. Wadman and N. G. Rost, 251 West Ninety-eighth Street, New York, N. Y.

THE JONAS LALLEY LIGHT COMPANY of Milwaukee, Wis., has been incorporated by August A. Jonas, John P. Peterson and Gustave Jonas. The company is capitalized at $25,000 and proposes to manufacture and install electric-lighting systems in isolated localities.

THE AUBURN ELECTRICAL COMPANY of Androscoggin, Auburn, N. Y., has been incorporated with a capital stock of $10,000 to do a general electrical and automobile business. The officers are: Fred H. Lancaster, president, and Elmer W. Nickerson, treasurer and clerk.

THE AMERICAN FUEL SAVING ENGINEERING CORPORATION of Fort Wayne, Ind., has been chartered with a capital stock of $1,000,000 by Austin W. Stultz, Charles H. Hall and Bruce M. Wylie. The company proposes to manufacture fuel-saving and smoke-consuming devices.

THE GEORGE POEHLMANN & SON COMPANY, 480 Third Street, Milwaukee, Wis., has been chartered with a capital stock of $50,000 to take over the business of George Poehlmann & Son, manufacturers of industrial electrical generating and distributing equipment. Orville G. Poehlmann is secretary and treasurer.

THE SUN POWER EQUIPMENT COMPANY has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $10,000. The company proposes to do an electrical engineering business, etc. The incorporators are: C. L. Rimlinger, M. M. Clancy and F. A. Armstrong, Wilmington, Del.

New England States

BANGOR, ME.—The Eastern Maine Railroad Company, it is reported, contemplates the construction of either a steam or electric railway from Bangor, crossing the Penobscot River to Brewer, thence in an easterly direction through the timberlands of eastern Maine through Holton, a distance of 112 miles. Right-of-way has been purchased for about 32 miles.

CONCORD, N. H. — Extensive improvements are under consideration by the Boston & Maine Railroad Company at its local plant, which provide for the erection of a new roundhouse and other changes. As yet nothing definite has been decided upon.

BRANDON, VT. — The Public Service Commission has granted the petition of the Hortonia Power Company asking permission to make a contract with Wetherbee & Sherman, owners of the iron mines and other industries, in Port Henry, N. Y., whereby the company might borrow $75,000 for development work. The project upon which the loan is to be expended is situated a short distance south of Middlebury.

BOSTON, MASS.—Plans have been filed by the New York, New Haven & Hartford Railroad Company for the construction of a one-story electric battery building, about 20 ft. by 140 ft., at Dover, near Boston. Contract has been awarded to C. W. Murdock, 185 Church Street, New Haven, Conn.

CLINTON, MASS.—A 66,000-volt transmission line, 16 miles long, connecting the power station at the Wachusett dam in Clinton with the power station at the Sudbury basin in Southboro will be completed about May 1. An existing electric transmission line, 1415 ft. long, connects the Wachusett station with the New England Power Company's line and a 13,200-volt transmission line connects the Sudbury power station with the line of the Edison Electric Illuminating Company. William E. Foss, 1 Ashburton Place, Boston, is chief engineer of the Metropolitan Water and Sewerage Board.

SHIRLEY, MASS.—The Shirley Electric Company has purchased the G. M. Ballou mill property, including a valuable water power, located in the center of the village. The company, it is understood, contemplates the construction of a new electric generating plant, together with substations.

SPRINGFIELD, MASS.—Contract has been awarded by the United Electric Illuminating Company for improvements to its State Street plant to the Stone & Webster Engineering Corporation of Boston. The cost of the work is estimated at about $300,000 and the plans provide for the installation of entire new switching equipment throughout the plant to replace the apparatus now in use, and a 25,000-hp. steam turbine to take the place of 16 of the old 400-hp. boilers.

SPRINGFIELD, MASS.—Work has been started by the Turners Falls Power & Electric Company on the construction of towers across Hampton Plains to the Springfield Street Railway Company's station on the Westfield River dike preparatory to erecting wires from the Southampton town line. The power belt will continue down the dike to East Main Street crossing the highway in the vicinity of Little River Street and thence to the Agawam town line.

WEST STOCKBRIDGE, MASS. — The local electric-light plant, owned by J. F. Bossidy, has been purchased by the C. D. Parker Company of Boston.

WHITMAN, MASS.—The town has voted to enter into a new five-year contract with the Edison Electric Illuminating Company of Brockton for lighting the streets of the town, under the terms of which ornamental lamps will be erected in the business district of the town.

NARRAGANSETT PIER, R. I. — The Town Council has agreed to accept the proposal of the Narragansett Pier Electric Light & Power Company for changing the lighting system on Caswell Street and placing the wires underground, provided the town will pay one-third of the cost.

BRIDGEPORT, CONN.—Plans of the United Illuminating Company of Bridgeport for the erection of a three-conductor 6600-volt transmission line on jointly used poles have been approved by the Public Utilities Commission, because "of the emergency due to war conditions."

Middle Atlantic States

ALBANY, N. Y.—Notice has been filed with the Secretary of State by the Havens Electric Company of an increase in capital stock from $25,000 to $100,000. Morton Havens, Jr., is interested in the company.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

ALBANY, N. Y. — The Public Service Commission has authorized the Hudson Power Corporation to issue $15,000 in capital stock. The company was incorporated to build a power plant on the Wallkill River near Rifton.

AUBURN, N. Y.—Application has been filed by the Empire Gas & Electric Company and the Empire Coke Company for authority to issue $170,000 in joint bonds, the proceeds to be used for extensions and new equipment in both the gas and electric departments, including new transmission lines. The principal work is to be a new substation on Clark Street to supply electricity to the manufacturing plants in the city.

BROOKLYN, N. Y.—Plans have been prepared by G. L. Knight, 13 Willoughby Street, for alterations and improvements to the power house of the Edison Electric Company on Gold Street.

BROOKLYN, N. Y.—The Bureau of Yards and Docks, Navy Department, Washington, D. C., has awarded contract to Westinghouse, Church, Kerr & Company for the construction of a one-story power house, 45 ft. by 80 ft., at the Brooklyn navy yard.

BROOKLYN, N. Y.—The War Department has decided to take over the waterfront property between Fifty-seventh and Sixtieth Streets at Bay Ridge, Brooklyn, on which it will erect a permanent quartermaster's warehouse, at a cost of about $25,000,000.

NEW YORK, N. Y.—Plans are under consideration by the Edison Storage Battery Company for the erection of a new three-story building, about 60 ft. by 100 ft., at 247-51 West Thirty-fifth Street.

NEW YORK, N. Y.—Bids will be received by the board of trustees or the curator of the College of the City of New York, 114 Main Building, 139th Street and Convent Avenue, New York, until April 16, for alterations and repairs, including the installation of electric-lighting system and alterations to fire-alarm system in the basement of the first story west of the main stair hall in the Twenty-third Street building of the College of City of New York, Lexington Avenue and Twenty-third Street. Copies of specifications, etc., may be obtained at the office of Crow, Lewis and Wickenhoefer, architects, 200 Fifth Avenue.

NYACK, N. Y.—The capital stock of the Rockland Light & Power Company has been increased from $1,000,000 to $1,300,000.

OXFORD, N. Y.—Bids will be received by Mrs. Georgianna Griffith, president of the board of managers of the New York State Women's Relief Corps Home, Oxford, until April 24 for a refrigeration plant. Drawings and specifications may be obtained from the New York State Women's Relief Corps Home, Oxford, at the New York City office of the Department of Architecture, Room 1224 Woolworth Building, and at the Department of Architecture, Capitol, Albany.

ST. GEORGE, S. I., N. Y.—Bids will be received by the president of the borough of Richmond, Borough Hall, St. George, New Brighton, until April 18, as follows: (1) For lighting fixtures of an additional county court house in the county of Richmond located at Jay and De Kalb Streets and Stuyvesant Place, St. George, contract No. 10: (a) For the entire work, complete, using brass plated steel chain for hanging fixtures; (b) for the entire work, using solid brass chain for hanging fixtures. (2) For electric clocks for the above court house. Blank forms, plans and specifications may be obtained at the office of the engineer, Bureau of Engineering, Borough Hall, St. George.

UTICA, N. Y.—The capital stock of the J. & M. Electric Company has been increased from $25,000 to $50,000.

WATERVILLE, N. Y.—Application has been filed with the Public Service Commission by the Waterville Gas & Electric Company for permission to construct and operate an electric distribution system to supply electricity for lamps and motors in the town of Marshall under a franchise granted by the Town Board in February.

BORDENTOWN, N. J.—Plans are being considered by the Board of Commissioners for the installation of new electric-lighting fixtures throughout the city hall building in connection with other improvements.

KEARNEY, N. J.—Plans are being prepared by the Niles-Bement-Pond Company, 111 Broadway, New York, N. Y., for the construction of new plant on the Lincoln Highway and the Hackensack River, Kearney. The cost of the initial work is estimated at about $2,000,000, and the plant will specialize in the manufacture of industrial locomotives and heavy machinery. Harris & Richards, Drexel Building, Philadelphia, Pa., are the architects.

NEWARK, N. J.—Plans have been filed by the New York Telephone Company, 15 Dey Street, New York, for improvements and alterations to its local telephone exchange building. Contract has been awarded to W. A. L'Hommedieu, 1 Madison Avenue, New York City.

TRENTON, N. J.—Plans are being prepared by the Crescent Insulated Wire & Cable Company, Olden and Taylor Streets, for the erection of a three-story addition, about 85 ft. by 100 ft., to its factory. The company manufactures cables, electric wire, etc.

BRIDESBURG, PA.—The Henry A. Hitner's Sons Company, Gaul and Hazzard Streets, Philadelphia, manufacturer of hardware and iron and steel specialties, contemplates the construction of a new plant at Buckius and Lefevre Streets, Bridesburg. Three buildings will be erected, one 110 ft. by 500 ft., two stories, and two shops, each 80 ft. by 150 ft., one story high.

CLIFTON HEIGHTS, PA.—Contract has been awarded by the Kent Manufacturing Company for the construction of its proposed power house to D. J. McNamee of Philadelphia, Pa.

EAST BRADFORD, PA.—Contract has been awarded by the Kendall Refining Company for the construction of an addition to its boiler plant, about 40 ft. by 75 ft.

KITTANNING, PA.—The Triple Airless Tire Company of Pittsburgh is planning to build a new plant in Kittanning, to cost about $85,000. The plans provide for the erection of a power plant, about 40 ft. by 80 ft. Herbert & Henderson of Kittanning are architects.

NEWCASTLE, PA.—The contract for the installation of a curb lighting system in the Seventh Ward has been awarded to the Ochiltree Electric Company of Pittsburgh, at $14,149.

PARKESBURG, PA.—Plans have been filed by the Parkesburg Iron Company for the erection of an addition to the boiler plant at its works. Contract has been awarded to the Rust Engineering Company, Penn Building, Philadelphia.

PHILADELPHIA, PA.—Permit has been taken out by the Bell Telephone Company for the construction of a new building at 5154 Lancaster Avenue.

PHILADELPHIA, PA.—The Philadelphia Storage Battery Company, Ontario and C Streets, is contemplating the construction of an addition, 40 ft. by 100 ft., one story, to its plant.

PHILADELPHIA, PA.—Work will soon begin by the Philadelphia Rapid Transit Company on the extension of its railway on Island Avenue at Eastwick to the shipbuilding works of the American International Company at Hog Island.

PHILADELPHIA, PA.—The Atlantic Refining Company, 3144 Passyunk Avenue, has awarded contract to Metzger & Fisher, Otis Building, for improvements and alterations to its power house at Thirteenth and Race Streets, to cost about $11,300.

PHILADELPHIA, PA. — Contract has been awarded by the Electric Service Supplies Company, Seventeenth and Cambria Streets, to the John N. Gill Company, Otis Building, for improvements to its plant. The company manufactures electrical supplies, etc.

PHILADELPHIA, PA.—Plans have been filed and contract awarded by the Philadelphia Storage Battery Company, Ontario and C Streets, for the construction of an addition to its plant, about 40 ft. by 100 ft. Contract has been awarded to Stewart Brothers, 2526 Orkney Street, Philadelphia, Pa.

REYNOLDS, PA. — The Atlas Powder Company has awarded a contract for the construction of power house and large outside buildings at Reynolds to Andrew Breslin of Summit Hill.

SHAMOKIN, PA. — The Pennsylvania Lighting Company, which supplies electricity in both Shamokin and Mount Carmel, together with a number of other towns in this vicinity, contemplates the erection of an electric transmission line to Natalie this summer.

FORT DUPONT, DEL.—Plans have been prepared for the erection of a one-story radio station at Fort Dupont for the United States government.

BALTIMORE, MD. — The Consolidated Gas, Electric Light & Power Company has awarded contract for construction of a substation to the Coggswell-Koether Company. The proposed building will be 26 ft. by 40 ft., one story high.

BALTIMORE, MD. — S. W. Greenland, general manager of the Fort Wayne & Northern Indiana Traction Company, has been engaged by the United States government to supervise the construction of a government power plant at Baltimore.

BALTIMORE, MD. — Plans are being considered by the City Council for extending the electric lighting, fire prevention, sewerage, etc., to the four new wards recently annexed to the city. Immediate attention will be given to lighting the roadways. Special attention will probably be given to such suburbs as Roland Park and Mount Washington in regard to lighting the streets, and the system throughout Highlandtown and Canton and other industrial suburbs will be greatly improved

MOUNT AIRY, MD.—The Mount Airy Ice & Electric Company is contemplating the installation of an additional generating unit and establishing a day service. C. C. Riddlemoser is manager.

MYERSVILLE, MD.—The City Council is considering the question of establishing a municipal electric-light plant and waterworks system.

CHARLESTON, W. VA.—The Charleston-Dunbar Traction Company, it is reported, contemplates placing contracts in the near future for the construction of a new power house and for two new boilers.

CHARLESTON, W. VA.—Plans are being prepared by the Charleston Interurban Railway Company for improvements to its system, involving an expenditure of about $500,000, among which is included the construction of a 2-mile extension.

OLCOTT, W. VA.—The Kanawha Central Power Company, recently incorporated, is planning to construct and operate an electric power plant. The company is capitalized at $100,000. I. C. Jordan and S. B. Avis are interested in the company.

NORFOLK, VA.—The Norfolk & Western Railroad Company is contemplating extensions to its shops and yards at North Bristol, involving an expenditure of about $300,000.

WASHINGTON, D. C.—The Washington-Virginia Railway Company is considering an extension of its system from Mount Vernon to Camp Humphrey, a distance of 4 miles.

North Central States

CHARLEVOIX, MICH. — The city of Charlevoix has recently placed a contract for a 300-hp. Leffel water wheel and generator to be installed at Bellaire, to be in operation by July 1. In the issue of Feb. 9 an item was published stating that the city of Charlevoix has leased the plant of the Hydraulic Power & Light Company of Bellaire. Through mistake the present equipment of the plant was given as new equipment contemplated for the plant. The transmission line (28 miles) was erected in 1906. A. J. Hamilton is superintendent.

FRANKFORT, MICH. — Bonds to the amount of $5,000 have been voted for improvements to the water-works system. It is proposed to replace the engines in the pumping station with electric motors.

CANTON, OHIO.—Improvement and alterations in the local system of the Ohio State Telephone Company, involving an expenditure of about $200,000, have been authorized by the State Public Utilities Commission.

CLEVELAND, OHIO. — The Cleveland Electric Illuminating Company is planning to erect a two-story addition 35 ft. by 168 ft., to its switch house. New equipment, including electric switches, generators, etc., will be purchased. F. Hansel, 408 Illuminating Building, is architect.

HICKSVILLE, OHIO.—Steps have been taken to secure the installation of a new lighting system in Hicksville.

MARIETTA, OHIO.—Application will be made to the City Council by the Kanawha Traction & Electric Company for a new franchise. The company contemplates a number of improvements in its system and service. The present franchise of the company expires in about three years.

MASSILLON, OHIO.—The plant of the Massillon Electric & Gas Company was recently damaged by fire, causing a loss of about $30,000.

SANDUSKY, OHIO.—The contract for electrical apparatus and fixtures for the new Good Samaritan Hospital Building has been awarded to Bonn Electric Company, at about $10,000.

YOUNGSTOWN, OHIO.—Work will begin at once by the Mahoning & Shenango Railway & Light Company on the erection of an electric transmission line from Lowellville to McDonald. This line will supply energy to operate the Youngstown & Niles Railway, now under construction.

HARLAN, KY.—Work has begun by the United States Coal & Coke Company on the development of 30 acres of coal land in Harlan County. The company, which is a subsidiary of the United States Steel Corporation, contemplates an expenditure of $4,000,000 with the expectation of ultimately producing from 10,000 to 12,000 tons per day. A modern town is being erected to accommodate 6000 workmen and their families.

LOUISVILLE, KY.—The Home Electric Company of Louisville has secured the contract for wiring the 29 new buildings at the quartermaster's depot at Jeffersonville; also the 15 new buildings to be erected by the Aetna Powder Company, near the Kentucky State Fair Grounds.

GOSHEN, IND. — The Hawks Electric Company is contemplating extending its electric transmission line from the Copeland farm, north of Ligonier, through that city to Cromwell, where it has a lighting contract. Electrical service will also be furnished to the farmers along the line.

CHICAGO, ILL.—The property at Prairie Avenue and Twenty-fourth Street has been purchased by the Packard Motor Company, which, it is understood, will erect a six-story service station for passenger cars and trucks. The cost of building and site is estimated at about $800,000.

EAST ST. LOUIS, ILL.—The capital stock of the East St. Louis Light & Power Company has been increased from $1,100,000 to $1,200,000.

OAKLAWN, ILL.—Preparations are being made by the Chicago & Eastern Illinois Railroad Company for the construction of an addition to its power house at Oaklawn to provide space for a large Ide generator to be installed. Contract has been placed for generator.

PERRY, ILL.—The Perry Light & Power Company has filed a petition with the Illinois Public Utilities Commission asking permission to discontinue business on the ground that the plant is not making expenses.

SPRINGFIELD, ILL.—The Springfield Plow Company is planning to build a new warehouse, four stories, complete with lighting apparatus and sprinkler system, to cost about $35,000.

ASHLAND, WIS.—The Ashland Light, Power & Street Railway Company is planning to build a new hydroelectric plant at Superior Falls, to cost about $100,000. The L. E. Meyers Company, 58 West Jackson Boulevard, Chicago, Ill., engineer and contractor, has charge of the work.

MILWAUKEE, WIS.—Plans are being considered by the Pelton Steel Company, Elliott Place and Chicago Road, for further extensions to its plant, which is equipped with a large electric furnace unit. The plans provide for the erection of two new buildings, to be equipped with an electrically-operated traveling crane and other machinery. As yet nothing definite has been decided upon. T. H. Harvey is general manager.

PESHTIGO, WIS. — The local electric-light plant is reported to have been purchased by T. A. Pamerin. Improvements are contemplated, it is understood, including the construction of a new dam and the purchase of additional equipment.

PLATTEVILLE, WIS — Arrangements have been made between the Interstate Light & Power Company of Platteville and the Mineral Point (Wis.) Service Company to connect their transmission lines from Rewey to Platteville to provide emergency service to the mines at Rewey. In case the energy cannot be supplied from the Mineral Springs plant, it can be obtained from Galena.

SUPERIOR, WIS.—The Lake Superior Electrical Company of Superior has been reorganized under the name of the Benson Electric Company and the capital stock increased from $50,000 to $250,000. The company manufactures automatic electric signals and steering control systems. M. B. Benson is president.

MANKATO, MINN. — A committee has been appointed to look into the question of establishing a municipal electric-lighting plant in Mankato.

EDDYVILLE, IOWA.—At an election held recently the proposal to issue $8 000 in bonds for improvements to the municipal electric light plant was carried.

HUMBOLDT, IOWA.—Bids will be received by the board of education of Humboldt until April 26 for the construction of a high school building, including steam heating, electric wiring, vacuum cleaner, temperature regulator, etc. The cost of the building is estimated at $110,000. J. E. Barker is secretary of board.

OTTERVILLE, MO.—The installation of an electric-light plant in Otterville is reported to be under consideration. Jesse Starten is interested.

BOWMAN, N. D.—The purchase of the electric plant of the Bowman Electric Light & Power Company is reported to be under consideration by Fred Cole of Broadhead, Wis., and Frank Christopher of Albany, Wis. If the deal goes through, it is understood that a new plant will be installed.

DALTON, NEB.—Bids will be received by the village of Dalton until April 30 for the construction of a power plant building, 36 ft. by 40 ft. Plans and specifications may be obtained at the office of Royal D. Salisbury, consulting engineer, 1415 East Colfax Avenue, Denver, Col., upon deposit of $10.00.

OGALALLA, NEB.—The installation of a 5-kw. series street-lighting circuit is under consideration by the Council. James H. Class is superintendent of the municipal electric-light plant.

OMAHA, NEB.—Revised plans have been completed by the Metropolitan Water District for the construction of an ice plant on Twentieth Street and Poppleton Avenue, to cost about $24,000. Bids will be taken on insulation, cooler doors, electric wiring, etc. R. B. Howell is general manager.

SIDNEY, NEB.—The contract for improvements to the municipal electric-light plant and water-works system has been awarded to the O'Fallan Supply Company of Denver, Col., at $30,592.

DIGHTON, KAN.—Bonds to the amount of $15,000 have been voted for improvements to the municipal electric-light plant and waterworks system.

LIBERAL, KAN.—The installation of a new street-lighting system in Liberal is reported under consideration. It is proposed to use ornamental standards carrying cluster lamps.

MORLAND, KAN.—The City Council is considering the installation of an oil engine and generator soon. F. S. Kay is superintendent of the municipal electric-light plant.

NORTH MANHATTAN, KAN. — Bids will be received by George W. Titus, president of the Rebekah Oddfellows' Home, Eureka, care of William J. Russell, Grand Secretary, Topeka, Kan., until April 29 for the construction of the Rebekah Oddfellows' Home at Eureka Lake. Separate bids to be submitted for heating apparatus, kitchen equipment, laundry machinery and refrigerator.

ROSSVILLE, KAN.—Preparations are being made by the Rossville Electric Light & Power Company to enlarge its plant and add steam power. The company is arranging to extend its transmission lines to Delia, Silver Lake and Willard. J. W. Phares is president.

Southern States

CHARLOTTE, N. C.—The Southern Public Utilities Company is contemplating increasing the generating capacity of its plant.

CHARLOTTE, N. C.—The Charlotte Electric Repair Company has awarded contract for a new addition to its plant, to cost about $5,000.

MORGANTOWN, N. C.—The Southern Power Company, it is reported, is considering the construction of a hydroelectric plant on the Johns River.

PINE LEVEL, N. C.—The Citizens' Power Company is planning the erection of two new substations in connection with its proposed 13-mile transmission system, which will connect several towns.

REIDSVILLE, N. C. — Bonds to the amount of $10,000 have been voted for extensions and improvements to the municipal electric-light plant.

CHARLESTON, S. C.—The Charleston Consolidated Railway & Lighting Company is now building a 500-kw. rotary substation near the navy yard to supply direct current to the suburban railway. J. D. Felton is chief engineer.

COLUMBIA, S. C.—Work has begun on the enlargement of the Omussee plant of the Columbia Power Company, to cost about $500,000. The company, it is reported, is contemplating establishing a plant at Kelso, to cost approximately $500,000. Tucker & Laxton of Charlotte, N. C., have charge of the work at the Omussee plant. Through error this item was published under Columbia, Ala., in the issue of March 30.

SUMTER, S. C.—The installation of a municipal electric-light plant is reported to be under consideration by the City Council.

ATLANTA, GA.—Bids will be received by the Department of Justice, office of superintendent of Prisons, Washington, D. C., until April 16, for furnishing electrical equipment at the United States Penitentiary, Atlanta, including a switchboard, power panel and electric feeders for lamps and motors for east main cell wing. Copies of specifications may be obtained on application to the above office.

COMMERCE, GA.—The City Council is considering calling an election to vote on the proposal to issue $15,000 electric light bonds.

JEFFERSONVILLE, GA.—Bonds to the amount of $21,000 have been authorized of which the proceeds of $6,000 will be used for the installation of a municipal electric-light plant and the remainder for water-works system.

SAVANNAH, GA.—Application will be made for a charter for the Chatham County Traction Company for the purpose of constructing an electric railway from the intersection of Augusta Avenue with Lathrop Avenue, Savannah, to Port Wentworh, a distance of about 6 miles. The company also proposes to own and operate an electric plant and to supply electricity for lamps and motors. The company is capitalized at $150,000. The incorporators are: H. C. Foss, secretary of the Savannah Electric Company; W. W. Osborne, A. A. Lawrence, David S. Atkinson and Edmund H. Abrahams, all of Savannah.

MOBILE, ALA.—The Murnan Shipbuilding Company has purchased a tract on the east shore of Mobile River, to be utilized for extensions to its shipyards, which will include the erection of a shed and sawmill with a daily capacity of 50,000 ft. of lumber, extensions to electric-lighting plant, dredge and fill.

RUSSELLVILLE, ARK. — The Arkansas Light & Power Company is installing a 2000-hp. steam turbine and a 1500-kw. generator (directly connected) in its Russellville plant. This is supplementary to the present 750-kw. generating unit and the large turbines and generators at the dam.

BLACKWELL, OKLA.—At an election held recently bonds to the amount of $82.-000 were voted, the proceeds to be used for improvements to extensions to the municipal electric-light plant and system; also $75,000 for waterworks, and $15,000 for fire-fighting apparatus.

PRAGUE, OKLA.—At an election held recently the proposal to issue $30,000 in bonds, the proceeds to be used for improvements to the municipal electric-light plant and water-works system, was carried.

DALLAS, TEX. — The Dallas Electric Light & Power Company has submitted to M. N. Baker, supervisor of public utilities, for approval requisitions amounting to $2,800,000. Nine of these requisitions, which it is estimated will cost $797,713, have been approved, among which are included the erection of a high-tension transmission line connecting the power house of the Texas Electric Power & Light Company at Norwood for exchange of power in case of breakdowns, also for changes in the generating plant and improvements to the distribution system; this work is under way. Requisition No. 3 is for the construction of a new substation in Oak Cliff and connecting the substation with main power station and the downtown substation; No. 11 is for the erection of an electric transmission line to Love Field, to cost $16,339.

Pacific and Mountain States

BREMERTON, WASH.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until April 15, under specification 2908 for an electric traveling crane for the gun shop building No. 140, naval station, Puget Sound, Wash. Further information may be obtained from the chief of the above bureau.

HOQUIAM, WASH.—A new machine shop and foundry, each 80 ft. by 140 ft., are being erected by the Lamb Machine Works. An electric steel furnace will also be installed.

SEATTLE, WASH.—The Acme Electric Company of Seattle has been awarded contract for installing electric fixtures, etc., in the offices of the United States Steel Products Company.

SEATTLE, WASH.—The Pacific States Electric Company, 570 First Avenue, South, Seattle, Wash., has been awarded contract by the Sloan shipyards of Olympia for electrical supplies in the twenty 3500-ton wooden ships now being built by the company.

SEATTLE, WASH.—Beginning with April all cluster lamps in the downtown district, with the exception of four at each corner of street intersections, have been eliminated. If the experiment proves feasible the plan will be continued. The action was taken for the purpose of conserving oil, for which the city is spending $800 per day. It is estimated that by eliminating the cluster lamps between street intersections $30,000 a year can be saved. No change will be made in the residence districts.

SEATTLE, WASH.—The lowest bid received by the Board of Public Works for the construction of a hydroelectric plant on the Skagit River was submitted by Grant Smith & Company, at $2,381,000, on plans prepared by the firm's engineers; on plans and specifications prepared by the city the company's bid was $4,297,000, both bids calling for cash rather than utility bonds. No bid was submitted for a transmission line, the cost of which is estimated at $1,000,000, or for a substation within the city limits. The same firm submitted a bid of $3,556,000 for a completed power plant on Wallace River, one of the tributaries of the Sykomish River, near the town of Gold Bar. Two bids were submitted by the Packwood Lake Construction Company for a completed power plant on Packwood Lake, at $4,031,000 for high-tension switching outside, and $4,121,000 for a complete power plant with switching inside. The Puget Sound Bridge & Dredging Company offered to develop the Skagit River project, together with transmission line and city substation, at cost of construction plus 15 per cent. and to accept payment in utility bonds. The same company offered a completed power plant on the Stillaguamish River project, offered to the city some time ago by J. C. Eden, owner, for $4,200 000 for steel penstock and $4,100,000 for wood penstock construction. The bids on a completed plant on the Skagit River cover the initial development on a project that may ultimately be increased to from 300,000 kw. to 500,000 kw.

WAPATO, WASH.—The City Council is considering a contract with the Pacific Power & Light Company for a new lighting system for the city, which will include new lamps for the business district and a number of 100-cp. lamps in the residence section suspended on brackets.

BAKER, ORE.—The Cornucopia Mines Company of Baker has recently been granted permission to appropriate the waters of Elk, Jim Fiske and Fall Creeks for power development.

KLAMATH FALLS, ORE.—Arrangements have been made between the California-Oregon Power Company and the Pacific Gas & Electric Company whereby the former will deliver 10,000 hp. of energy to the latter at a point in the Sacramento Valley, which will cause a saving of fuel oil, costing $450,000 yearly. Electricity will be generated at the Copco plant on the Klamath River in Siskiyou County and will be transmitted nearly 300 miles before it reaches the system of the Pacific Gas & Electric Company.

MAPLETON, ORE. — The North Star Power Company is planning to erect 2 miles of transmission lines within the next 90 days. A. L. Shreve is manager.

PENDLETON, ORE.—The Helix Flouring Company has awarded contract to John Vaughan of Pendleton for the installation of a complete electric system for lamps and motors at its plant.

PORTLAND, ORE.—A permit has been granted to the Electric Steel Foundry, Twenty-fourth and York Streets, to erect a transformer station at its plant.

CORCORAN, CAL.—Preparations are being made by the San Joaquin Light & Power Company for the installation of an electrolier lighting system on Whitley Avenue. The lamps will be maintained by underground wires.

EL CENTRO, CAL. — Preparations are being made by the directors of the Imperial Irrigation District for the erection of an electric transmission line from Hanlan to a point on the Alamo River, to cost about $11,000.

EUREKA, CAL.—As a result of the activity in shipbuilding industry at Eureka, the Western States Gas & Electric Company has taken on a large amount of business lately. The Hammond Company has abandoned its private plant, which operated its sawmill during the day, and will purchase energy from the Eureka division. The Rolph Company is doubling its electric power requirements and the new shipyard to be established in the city will require 400 hp.

LOS ANGELES, CAL.—Bids will be received by the Board of Supervisors of the County of Los Angeles until April 15 for moving and erecting boilers in the new power house at the County Hospital in the city of Los Angeles. Plans and specifications may be obtained at the office of the Board of Supervisors.

LOS ANGELES, CAL.—The contract for the installation of the ornamental lighting system on Broadway, between the tunnel and Tenth Street, has been awarded by the Board of Public Works to the Keystone Iron Works. The total cost of the work is estimated at $65,000. The new standards will be 27 ft. high, each equipped with two inverted arc lamps.

LOYALTON, CAL.—The city of Loyalton is considering replacing the present turbine in the municipal electric plant with an impulse waterwheel in June. C. I. Simmons is general superintendent.

REDDING, CAL.—The Shasta Land & Timber Company of Redding, it is reported, will rebuild its electric power plant and planing mill, recently destroyed by fire. The loss is estimated at $45,000.

VALLEJO, CAL.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until April 22, under specification 2872 for furnishing two rotary connectors and switchboard for the navy yard at Mare Island, Cal.

DENVER, COL.—The Colorado Power Company of Denver has sold $250,000 in capital stock, the proceeds to be used to pay for additions and extensions already made and for the construction of a steam power station in Sterling.

STERLING, COL.—The Colorado Power Company is contemplating the construction of a steam driven generating plant in Sterling.

LEWISTON, IDAHO.—F. S. Rice, president of the Union Copper Mining & Smelting Company, it is reported, has presented to the citizens of Lewiston a project to tunnel a mountain and divert the waters of the Salmon River of Idaho across the Horseshoe Bend in that stream in Idaho County, in connection with a hydroelectric power development. The project, it is said, has been financed. It is estimated that 62,000 hp. could be developed. The primary object of the company is the erection of an electrolytic smelter for the reduction of copper ores in the mountains in the vicinity of Horseshoe Bend.

DESERET, UTAH.—The Deseret Irrigation Company is reported to have closed a contract for the installation of a 100-hp. electric generating plant with the erection of 15 miles of transmission lines. In addition the company has placed contracts for the construction of a 250-hp. plant to be put in operation at a later date and operated in connection with the first project. The transmission lines of the company will extend from Deseret to Hinckley, Oasis and Abraham. Milton Moody is president of the company.

HELENA, MONT. — It is reported that the proposed manganese plant of the Anaconda Copper Mining Company at Great Falls will require approximately 21,000 kw., which is about one-half of the output of the Holter plant of the Montana Power Company, which, it is understood, will furnish energy to operate the manganese plant.

COLUMBUS, N. M.—The Columbus Electric Light & Power Company is reported to be considering the construction of a new electric plant to supply electricity in Columbus and Camp Furlong, to cost about $30,000.

LORDSBURG, N. M.—The local engine house of the Southern Pacific Railroad Company was recently destroyed by fire, causing a loss of about $500,000.

Mexico

TOLUCA, MEX.—The Molina de la Union of South America is planning to replace the present arc lamp street-lighting system with Mazda series lamps.

Miscellaneous

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until April 23 for furnishing planished steel, sheet iron, spring steel, steel wire and cable, ignition cable, induction motors, etc. Blanks and information relating to this circular (1213) may be obtained from the above office or the offices of the assistant purchasing agents, 24 State Street, New York City, and 606 Common Street, New Orleans, La.

Record of Electrical Patents

Notes on United States Patents

(Issued March 12, 1918.)

1,259,371. Cooling System: David D. Davis, Swissvale, Pa. App. filed April 25, 1914. Effective means of controlling the cooling action in transformers and rectifiers.

1,259,383. Insulator: Charles Le G. Fortesque, Pittsburgh, Pa. App. filed May 11, 1914. Supporting high-voltage lines.

1,259,384. Insulating Support: Charles Le G. Fortesque, Pittsburgh, Pa. App. filed May 25, 1914. Improvements.

1,259,386. Electrical Terminal: Charles Le G. Fortescue, Pittsburgh, Pa. App. filed June 4, 1915. High-potential conductors.

1,259,396. Vibrator: Albert E. Hartwell, San Francisco, Cal. App. filed Oct. 16, 1916. Motor eliminated.

1,259,406. Relay: Ernest H. Jacobs, Schenectady, N. Y. App. filed June 2, 1914. Protection to alternating-current electrical apparatus.

1,259,420. Arc Lamp: George M. Little, Pittsburgh, Pa. App. filed Oct. 3, 1913. Improvements in condensing chambers.

1,259,443. Metal-Petticoat Insulator: Karl C. Randall, Edgewood Park, Pa. App. filed Aug. 6, 1915. High-potential lines.

1,259,444. Windings and Insulation for Electric Apparatus: Emerson G. Reed, Wilkinsburg, Pa. App. filed June 14, 1912. Small quantity of insulating material.

1,259,452. Electric Connector: George A. Burnham, Saugus, Mass. App. filed Oct. 1, 1915. Water-tight insulating inclosure.

1,259,453. Electrical Distribution System: George A. Burnham, Saugus, Mass. App. filed May 27, 1916. Split-conductor system.

1,259,454. Time-Limit Device for Electric Switches: George A. Burnham, Saugus, Mass. App. filed Dec. 18, 1916. Improvement.

(Issued March 19, 1918.)

14,446 (reissue). Selective Relay: Frank L. Dodgson, Rochester, N. Y. App. filed April 11, 1916. For controlling a highway crossing signal.

1,259,482. Locking Lamp Socket: Thomas H. A. Brown, Heidelberg, Transvaal, South Africa. App. filed Oct. 27, 1915. Improvements.

1,259,485. Process of Making Electric Batteries: Thomas W. Byrne, Boston, Mass. App. filed Jan. 7, 1916. Dry or semi-dry type.

1,259,496. Telephone-Call-Distributing System: Alfred H. Dyson, New York, N. Y. App. filed Jan. 30, 1913. Applicable to operating exchange.

1,259,512. Insulator: Charles J. Hellings, Los Angeles, Cal. App. filed Jan. 17, 1916. May be readily changed from a stationary insulator to a swinging insulator.

1,259,515. Electromagnetic Measuring Instrument: John S. Holliday, Wilkinsburg, Pa. App. filed May 14, 1915. Adapted to determine the phase difference between electromotive forces.

1,259,516. Signal Device: Lewis S. Howard, Chicago, Ill. App. filed March 24, 1917. A simultaneously actuated signal carrier and shutter which co-operate to disclose the desired signal.

1,259,529. Ignition System: Lawrence Langner, New York, N. Y. App. filed Sept. 22, 1913. For internal-combustion engines of automobiles.

1,259,565. Transformer: Chester H. Thordarson, Chicago, Ill. App. filed Jan. 24, 1913. Ventilates the coil by directing the passage of a cooling medium through determinate passages in the coil structure.

1,259,577. Thermostatic Switch Device: Fred W. Wolf, Chicago, Ill. App. filed Dec. 20, 1916. For controlling an electric circuit.

1,259,594. Treatment of Zinc-Bearing Material Containing Iron: Anson G. Betts, Asheville, N. C. App. filed April 21, 1916. Secures a high percentage of extraction of the zinc present.

1,259,597. Device for Preventing Telephone Cords and the Like from Twisting: John A. Breen, New Hartford, N. Y. App. filed Jan. 25, 1917. Improvements.

1,259,609. Electric Attachment Plug: Harry W. Denhard, San Francisco, Cal. App. filed Oct. 31, 1911. Small number parts.

1,259,612. Electric Light Socket: Leslie W. Friedel, Burlington, Iowa. App. filed April 5, 1917. Electric signs.

1,259,672. Brush Gear for Dynamo-Electric Machines: Harry D. Rohman and Frank R. Peters, New York, N. Y. App. filed Feb. 16, 1917. Substitute for special pole-changing mechanism.

1,259,683. Process for the Electrolysis of Alkali Chlorides: Rolf van Hasselt, The Hague, Netherlands. Improvements.

1,259,696. High-Voltage-Measuring Instrument: John B. Whitehead, Baltimore, Md. App. filed April 29, 1916. Voltage determined by the presence of corona.

1,259,736. Curtain-Shade Circuit Closer: John Havran, Portland, Ore. App. filed May 18, 1915. Electric alarm.

1,259,744. Engine-Starting System: John H. Hunt, Dayton, Ohio. App. filed July 3, 1914. Improvements.

1,259,752. Connector: Guy M. Laird, Chicago, Ill. App. filed May 11, 1916. Detachable coupling for electrical conductors.

1,259,766. Distribution Box: Earl G. Negley, Canton, Ill. App. filed May 24, 1917. Electric light and power service.

1,259,788. Magnetic Separator: John G. Sekinger, Ford City, Pa. App. filed July 21, 1915. Effective in removing the iron and steel from the cullet.

1,259,816. Vehicle Lamp: Charles M. Wilson, Elmira, N. Y. App. filed Oct. 7, 1916. Parts may readily be assembled or removed.

1,259,835. Controlling System for Receiving Apparatus: Allen D. Cardwell, Brooklyn, N. Y. App. filed Nov. 19, 1913. Adapted to operate by impulses sent over a main line.

1,259,842. Electrode Holder for Electric Furnace: Paolo Fischer, Chicago, Ill. App. filed June 8, 1917. Improvements.

1,259,861. Electrical Magnetic Drive and Clutch: David C. Henry, Rosebank, N. Y. App. filed March 22, 1916. Improvements.

1,259,862. Telephone System: Willi Herrmann, Berlin-Schoenberg, and Otto Stritter, Lictenrade, Germany. App. filed Oct. 25, 1916. Improvements.

1,259,901. Relay: Frederick R. Parker, Chicago, Ill. App. filed Feb. 19, 1904. Improved.

1,259,906. Service-Recording Instrument: George H. Richards, New York, N. Y. App. filed Aug. 4, 1916. Electrically connected with machine.

1,259,907. Incandescent Lamp: Thomas B. Rider, Los Angeles, Cal. App. filed May 2, 1917. Inserts automatically a new filament when one of the first-burning filaments burns out.

1,259,908. Signal Lamp: Gordon E. Roedding and Edward B. Roedding, Detroit, Mich. App. filed Feb. 29, 1916. Motor vehicles.

1,259,915. Announcer or Indicator: John L. Shahan, West Pullman, Ill. App. filed March 29, 1916. Improvements.

1,259,967. Telephone System: Alfred H. Dyson, Chicago, Ill. App. filed Sept. 6, 1906. Improvements.

1,259,995. System of Selective Electrical Distribution: Charles F. Kettering and William A. Chryst, Dayton, Ohio. App. filed Nov. 20, 1912. Improvements.

1,260,008. Telegraphic Sending Machine: Horace G. Martin, Rutherford, N. J. App. filed Aug. 4, 1917. Improvement.

1,260,010. Dynamo-Electric Clutch: William Morrison, Des Moines, Iowa. App. filed Sept. 18, 1913. Self-generating type.

1,260,025. Protector for Meter Connections: Stephen R. Payson, Providence, R. I. App. filed July 29, 1916. Protects case where a cartridge fuse may be readily moved into position to bridge the service and meter terminals.

1,260,067. Portable Flashlight: Julius Samach, New York, N. Y. App. filed June 30, 1917. Non-short-circuiting holder.

1,260,070. Stranded-Control X-Ray System: Louis W. H. Schimpf, New York, N. Y. App. filed March 15, 1917. Improvements.

1,260,071. Storage-Battery Jar: Earl T. Schumucker, Rapid City, S. D. App. filed Aug. 1, 1917. Improvements.

1,260,085. Electrical Connector: Parke T. Snyder, Chicago, Ill. App. filed Dec. 14, 1916. To provide a socket with a pair of contacts arranged in position for direct engagement.

1,260,094. Power Indicating and Limiting System: John B. Taylor, Schenectady, N. Y. App. filed Oct. 27, 1914. Direct-current railway systems to which power is suppplied by a plurality of sources.

1,260,152. Nipple: Mark V. Croker, Newton Upper Falls, Mass. App. filed Feb. 1, 1917. For water and gas pipes.

1,260,160. Insulator: Charles Disbennet, Logan, Ohio. App. filed May 8, 1917. Wire-retaining devices.

1,260,195. Electrical Speed Transmission: Felix W. Hill, Proctor, Minn. App. filed March 14, 1916. No mechanical connection between the driving and driven members.

1,260,215. Controller for Electric Motors: Wilmar F. Lent, Philadelphia, Pa. App. filed March 26, 1917. Adapted to utilize a portion of the starting resistance for subsequent regulation.

1,260,218. Charging System for Storage Batteries: James F. Lincoln, Cleveland, Ohio. App. filed Sept. 19, 1914. Automatic when connected to the battery.

1,260,224. Railway Electric Signaling Means: Otto M. McLin, Bolivar, Mo. App. filed Jan. 27, 1917. Source of electric energy carried by the passing train.

1,260,230. Electromagnetic Switch: Merle M. Mason, Cleveland, Ohio. App. filed June 11, 1914. Controlled by a light current.

1,260,236. Course Indicator: Willy H. R. Mildebrath, Jacksonville, Fla. App. filed Jan. 29, 1917. For motor vehicles.

1,260,252. Electric Heater: Philip F. Apfel, Seattle, Wash. App. filed April 3, 1917. Inclosing case whose top wall is made of molded refractory earthy material.

1,260,263. Electrically Heated Soldering Bolt or Bit: Francis Husband and Albert E. Woodhouse, London, England. App. filed Oct. 18, 1917. Improvements.

1,260,298. Phase Distribution for Electric Furnaces: Thaddeus F. Baily and Frank T. Cope, Alliance, Ohio. App. filed Jan. 31, 1918. Three-phase supply is distributed to two electric furnaces.

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1,260,303. Wireless Time Signaling: Edouard Belin, Paris, France. App. filed Oct. 24, 1914. Improvements.

1,260,317. Clock-Controlled Electric Circuit: James W. Bryce, Bloomfield, N. J. App. filed July 21, 1917. Improvements.

1,260,328. Electrical Heater: Hoyt W. Chase, Indianapolis, Ind. App. filed July 21, 1917. For use with hand wheels.

1,260,354. Physician's Electrical Appliance Control: Herman G. Fischer and Peter P. Musket, Chicago, Ill. App. filed Jan. 11, 1915. Supply electric charges to vacuum electrodes.

1,260,355. Ventilated Spark Gap: Herman G. Fischer, Chicago, Ill. App. filed April 1, 1916. Improvements.

1,260,360. Lamp Socket: Edgar H. Freeman, Trenton, N. J. App. filed Jan. 6, 1915. Large voltage.

1,260,363. Mercury Relay: Maniquis Garl, Akron, Ohio. App. filed May 26, 1917. Electrical signaling apparatus.

1,260,379. Electric Battery: Clarence W. Hazlett, Lakewood, Ohio. App. filed Sept. 23, 1916. Secondary type.

1,260,380. Sanitary Telephone-Transmitter Cover: Shiro Higuchi, Los Angeles, Cal. App. filed June 4, 1917. Renders the telephone more sanitary.

1,260,381. Polyphase Watt-Hour Meter: Jacob H. Hodde and Otis White, Springfield, Ill. App. filed March 12, 1913. Two torque-producing elements are employed to drive a single shaft.

1,260,386. Electrical System of Distribution: John W. Jepson, Buffalo, N. Y. App. filed Aug. 24, 1915. Improvements.

1,260,400. Electric Fitting: George C. Knauff, Chicago, Ill. App. filed Feb. 16, 1917. Improvements.

1,260,401. Lamp Socket: George C. Knauff, Chicago, Ill. App. filed Feb. 26, 1917. Electric fittings employing slidably mounted conducting elements.

1,260,412. Telephone-Exchange System: Alben E. Lundell, New York, N. Y. App. filed Sept. 22, 1916. Semi-automatic.

1,260,413. Listening-Key Circuits: Alben E. Lundell and Franklin A. Stearn, New York, N. Y. Telephone-exchange systems.